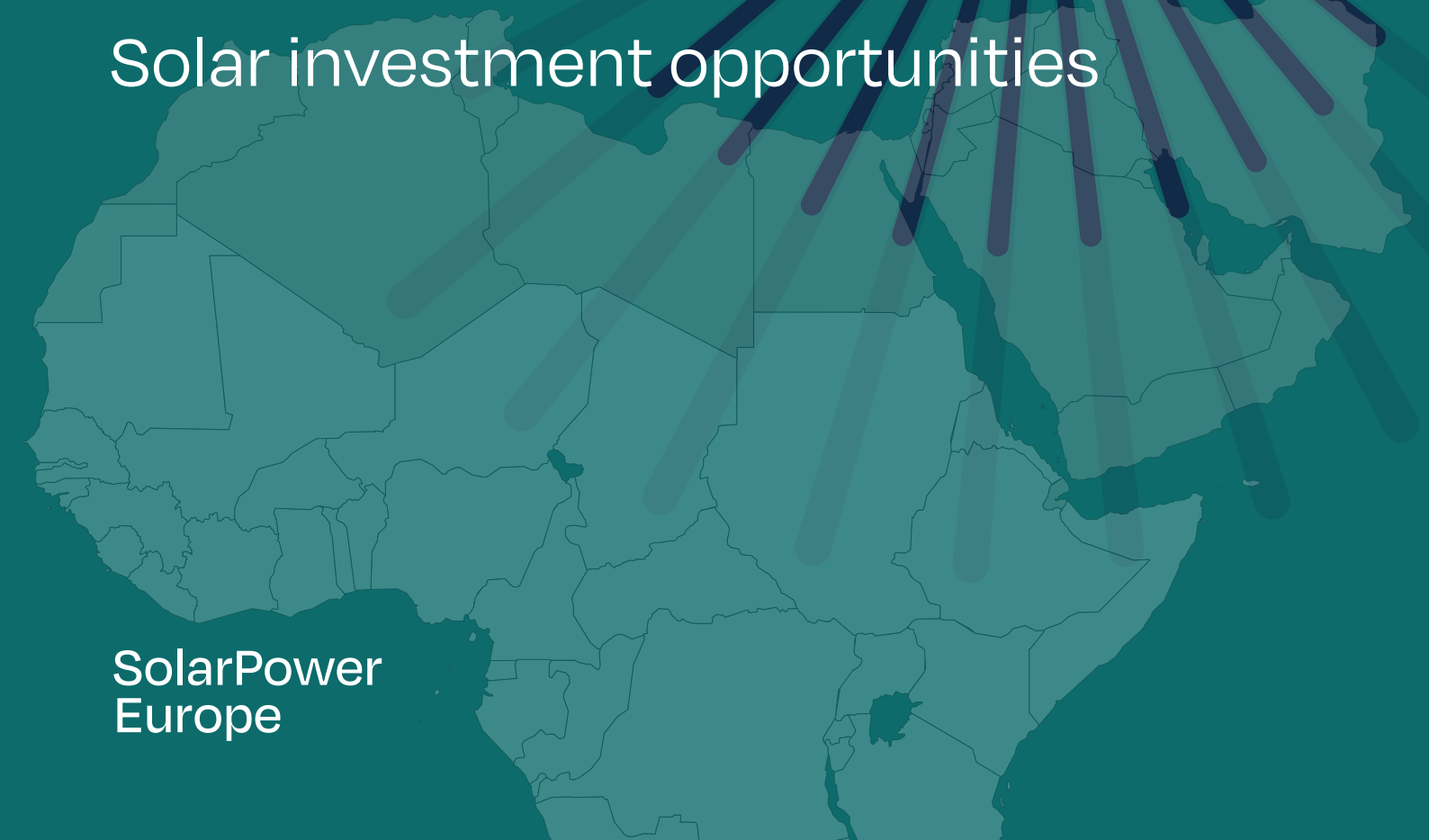
Middle East

Solar investment opportunities



SolarPower Europe

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Project Information: The SolarPower Europe Emerging Markets Workstream was launched in March 2018 and has since then become an active working group with more than 150 experts from more than 70 companies. The objective of the Workstream is to identify opportunities for business and cooperation and thereby contribute to the energy transition in emerging markets outside Europe.

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Foreword

The SolarPower Europe Emerging Markets Workstream was launched in March 2018 to identify new avenues for business and cooperation, and to contribute to the global energy transition. Since its creation, the workstream has continued to grow and now comprises 150 experts from more than 70 companies, with a significant portfolio of investments in emerging markets around the world.

In this report we are proud to present our findings on solar investment opportunities in the Middle East and North Africa. It covers markets in Egypt, Jordan, Oman, and Saudi Arabia, and was written by experts from RES4Africa Foundation, Alectris, Finergreen, and EXXERGY. This report provides a general overview of the business environment, major macroeconomic and socio-political trends in each of the four countries. It goes on to elaborate the specific national energy context, key stakeholders, and regulatory frameworks for investments in the solar sector. Finally, the experts make several recommendations for each country that are designed to harness the enormous photovoltaic potential of the region and encourage international investment in the four markets.

The Middle East and North Africa report is the tenth in a series of SolarPower Europe market reports that include: Mozambique; Senegal; Côte d'Ivoire; Myanmar; Kazakhstan; India; Tunisia, Latin America, and Algeria. These reports have enabled fruitful discussions between SolarPower Europe's members and key energy sector stakeholders in the respective countries, including public and private sector representatives as well as international organisations. All the reports can be downloaded from www.solarpowereurope.org, free of charge.

In addition to the market reports, in the past year, the workstream has produced a number of input papers for the European Commission on topics such as the international energy diplomacy, guarantee facilities and trade instruments. We are also cooperating with the International Renewable Energy Agency (IRENA), the International Solar Alliance, the Global Solar Council, and cooperation programmes such as GET.invest to support the scale-up of solar energy in emerging markets.

If you would like to be part of our activities, discover new solar business opportunities, and have a say in shaping EU global policy, join SolarPower Europe's Emerging Markets Workstream.

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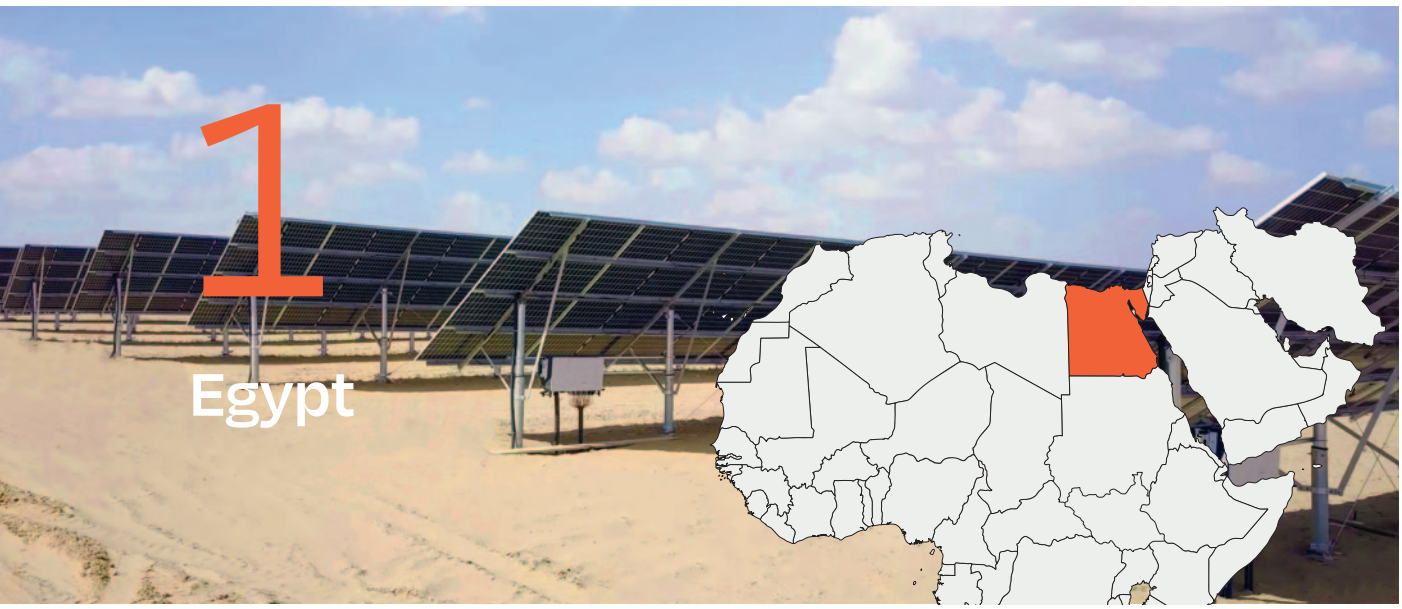


Solar PV panels, Egypt. © Wadstock/Shutterstock

TABLE 1 MACROECONOMIC DATA FOR EGYPT

Language	Arabic
Capital	Cairo
Currency	Egyptian Pound
Surface area (2018)	1.01 million km^2
Population (2020)	102,334 million
Population density (2020)	103 people/ km^2
GDP (2020)	363.1 bn US$
GDP per capita (2020)	3.547.9 US$
GDP annual growth (2020)	3.6%
MENA region GDP annual growth average (2020)	-4.0%
Unemployment rate (2020)	10.4%
Literacy rate (2017)	71%
Internet connections (% of the population) (2020)	71.91%
Mobile phone subscriptions per 100 people (2020)	93

SOURCE: World Bank Group, 2017, 2018, 2020.

1.1. Economic, social and political context

1.1.1. Macroeconomic context

Egypt's 2016 macroeconomic and structural reforms allowed the country to absorb the shock of the COVID-19 pandemic. However, real growth declined from 5.6% in Financial Year (FY) 2018/19 to 3.6% during FY2019/20, as the COVID-19 crisis caused a year-on-year contraction of 1.7% from April to June (Q4-FY2019/20) (World Bank Group, 2021). In 2020, Egypt was the second largest MENA economy with a total GDP of 363.1 billion US$ and is expected to grow by 2.8% in 2020-21 (IMF, 2021). Key economic sectors, trade, tourism, manufacturing, and agriculture benefited from government support in the form of a series of financial packages and measures. These included a monetary grant to irregular workers and the expansion of existing cash transfer programs in addition to subsidised credit. Further support to the economy came from IMF: Egypt secured 7.8 billion US$: 5 billion US$ in stand-by agreement and 2.8 billion US$ in COVID-19 emergency support (Bloomberg, 2020). This will help Egypt maintain macroeconomic stability while protecting necessary spending to cope with the effects of the pandemic.

Key structural reforms included the liberalisation of the exchange rate. This proved to be successful in restoring the international investment community's confidence in the Egyptian economy (Santander Trade, 2020). As a result, inflation rates declined over the past year contributing to a more stable economic environment. Among other measures, the Government adopted the Investment Law in 2017 granting special investment incentives for projects in renewable energy as part of the national energy diversification strategy.

1.1.2. Business environment

Egypt maintained S&P BB credit rating amid the COVID-19 pandemic. The macroeconomic stability and the monetary and fiscal reforms improved the business climate, facilitated greater access to finance and private sector-led investments, consolidated investor-friendly policies and made business services more efficient. As a result, Egypt ranked 114th out of 190 countries according to the last Doing Business Report (World Bank Group, 2020) gaining six places compared to 2019. It came above the regional average for both starting a business (90) and dealing with construction permits (74). The efforts to turn it into an investment hub placed the country as the second-largest recipient of foreign direct investment (FDI) flows in the MENA region, which in 2019 grew by 11% to 9 billion US$. Although much FDI is still driven by the oil and gas industry, capital is also targeting a range of strategic sectors including renewable energy development.

1.1.3. Political and social context

The current leader of the country is President Abdel Fattah Al-Sisi, a retired General and experienced politician who previously served as Director of Military Intelligence (2010-2012), Minister of Defence (2021-2014), and as Deputy Prime Minister of Egypt (2013-2014). President Al-Sisi came to power in 2014 after his predecessor, President Mohamed Morsi, was removed from office by a military coup in 2013. In 2018 he won a second term in a controversial election where he faced only nominal opposition. Shortly after his re-election, constitutional amendments were brought in that allowed President Al-Sisi to extend his term until 2030, solidifying his position as absolute authority in the country, and the military's domination of the political sphere (Human Rights Watch, 2021).

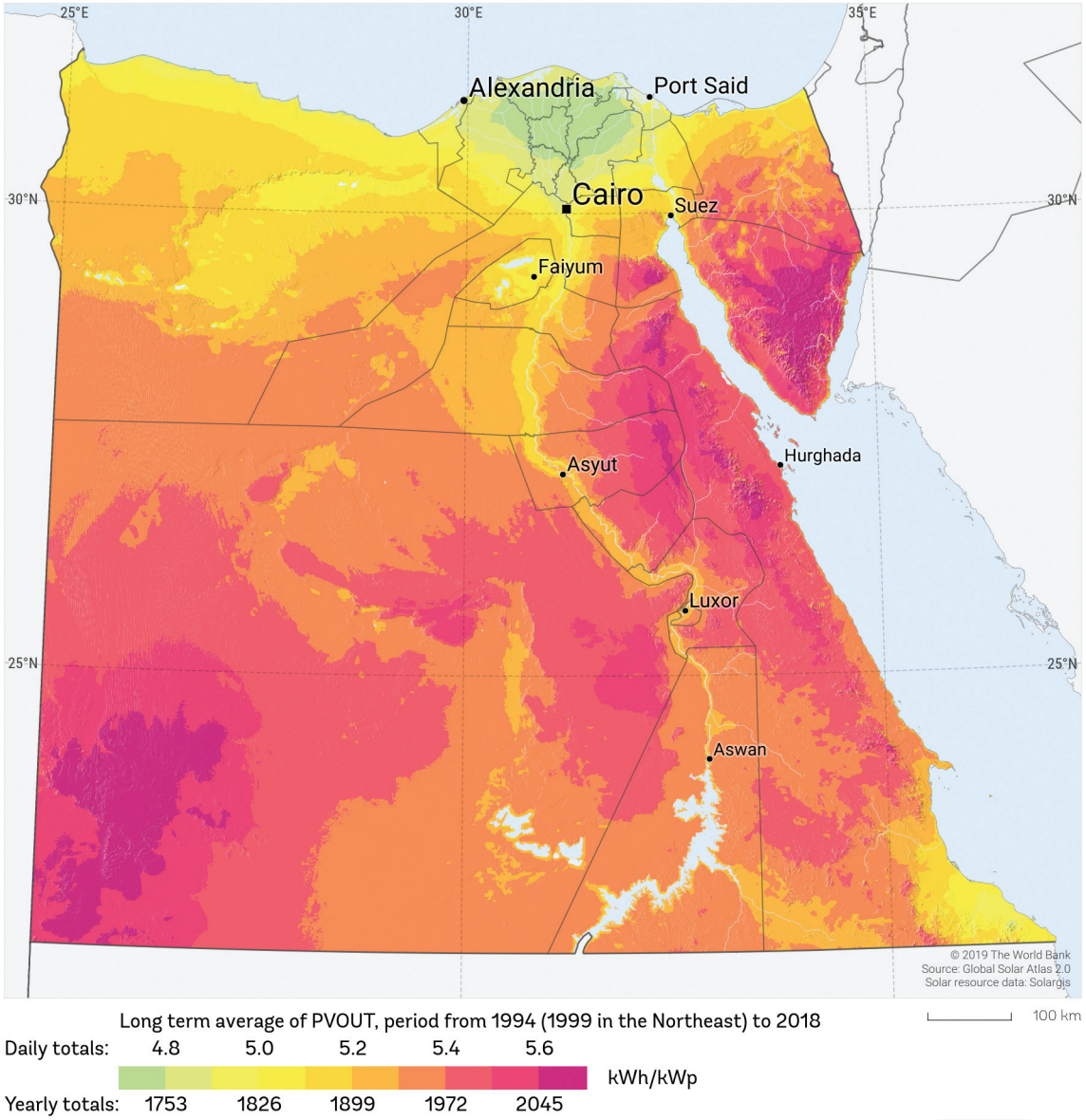
Population pressure is one of the key factors driving the national economic agenda. Egypt is the most populous country in the MENA region, and the third-most populous country in Africa after Nigeria and Ethiopia. Its population reached 100 million in 2019. Nevertheless, one third of the country's population lives below the poverty line and unemployment rates rose to 9.6% during the first wave of COVID-19, followed by a decline to 7.2% in the second half of 2020 (World Bank Group, 2021). The female unemployment rate is markedly above that of males: 21.4% compared to 6.8% respectively (CAPMAS, 2020). Egypt's relations with countries in the region also pose a risk to its political and social stability. Its relations with neighbouring country, Ethiopia, have soured following the latter's unilateral decision to fill the new Grand Ethiopia Renaissance Dam's reservoir, potentially jeopardising Egypt's water security.

1.2. Energy and electricity

1.2.1. Energy sector situation

Egypt is the largest non-OPEC oil producer in Africa and the third-largest dry natural gas producer in the continent after Algeria and Nigeria (Energy Information Administration, 2018). However, in 2014, its production was insufficient to satisfy the country's economy and rapidly growing population, leading to a severe energy shortage. In 2015, the Egyptian government received good news about the discovery of the largest offshore gas field (named Zohr) in the Mediterranean, just inside its economic maritime border. While gas production from Zohr only started at the end of 2018, Egypt managed its gas supply shortfall in the interim by importing gas (LNG and pipeline imports) from neighbouring countries. The country also contracted Siemens to construct three combined cycle power plants, adding 14.4 GW to Egypt's power grid. This boosted Egypt's power generation capacity by more than 45% set Egypt firmly on the path to long-term power security (Siemens, 2018). In addition, in 2020 the Zohr gas field production exceeded three billion cubic feet, representing 40% of total Egyptian gas production (e-gazette, 2020). With this, Egypt has moved from a net gas importer to regain its place in the gas export market. It has also emerged as a regional energy hub, thanks to pre-existing LNG terminal and gas pipeline connections with neighbouring countries. However, now Egypt faces major challenges in

FIGURE 1 EGYPT'S SOLAR PHOTOVOLTAIC POWER POTENTIAL

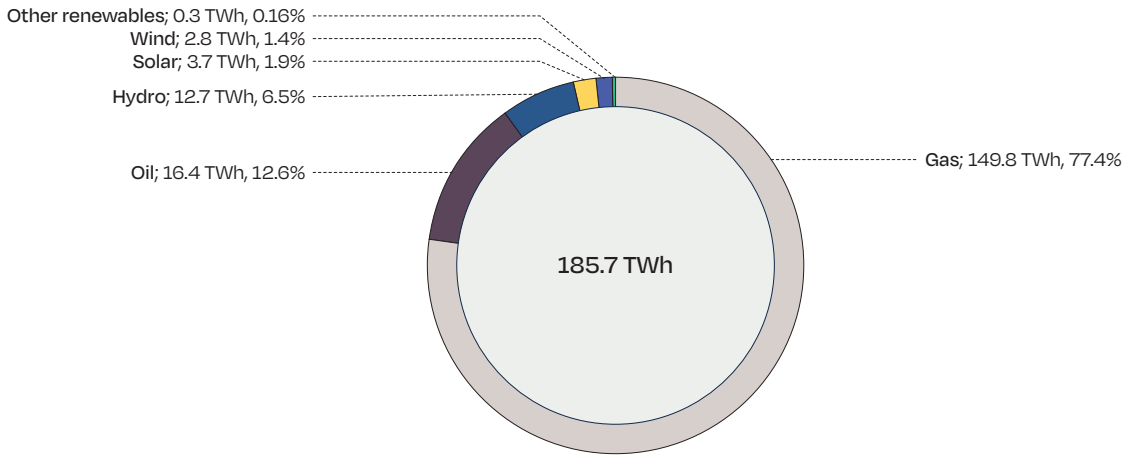


SOURCE: Global Solar Atlas 2.0, Solar resource data: Solargis.

addressing the overcapacity of energy supply. This overcapacity was aggravated by the COVID-19 pandemic as electricity exports were temporarily frozen and energy demand slumped. Addressing overcapacity in the country's power generation is crucial, not least because it presents a real threat to the development of renewable energy projects.

Recently, Egypt has sped up its energy transition and diversification. In 2015, Egypt placed renewable energy sources at the heart of the Integrated Sustainable Energy Strategy (ISES). This was adopted along with the New Electricity Law, to drive sustainable socio-economic development and energy diversification. To this end, the Government launched various combinations of policies and flexible mechanisms to

FIGURE 2 EGYPT'S ELECTRICITY MIX IN 2019



SOURCE: Ritchie and Roser, published on OurWorldInData.org, 2020.

progressively liberalise the energy market, in particular a feed-in-tariff, a net-metering scheme, and Government auctions. These measures increased investors' confidence in the Egyptian energy market.

The 2015 Integrated Sustainable Energy Strategy (ISES) was updated in 2021 with a vision towards 2040. The current strategy includes abolishing the use of coal for electricity generation and replacing it with renewable sources. Subsequently, ISES aims to achieve a 20% share of renewable energy in the total electricity mix by 2022, 55% by 2035 (previously 42%) and 61% by 2040 (a new-entry target). Of the 2040 target, 45 percentage points of the renewable energy share will be solar PV, 13 percentage points will be wind and 3 percentage points will be hydro. This raised ambition is clear evidence of Egypt's commitment lower CO_2 emissions and increase the share of green energy in the country's energy mix. When it comes to solar, Egypt has a vast solar resource, totalling between 2,000 and 3,200 kWh/m^2/year from the north to the south of Egypt (IRENA, 2018). However, solar installed capacity only accounted for around 2 GW as of 2020 (SolarPower Europe, 2021), while the solar potential in the East and West Nile areas can reach up to 52.3 GW, according to the Global Solar Atlas (World Bank Group, 2020). Up to 2020, the Government approved about 3,400 MW PV projects and 750 MW Wind projects for a total investment of around 28.6 billion US$ (NREA, 2020). In 2020, the total renewable energy installed capacity amounted to around 6 GW produced from hydro (2,832 MW), followed by solar PV (1,623 MW), wind (1,375 MW), Concentrated Solar Power (140 MW) and biomass (12 MW).

In September 2020, the Government launched its first green bond issue, worth 750 million US$ for five years, on London Stock Exchange. The Minister of Planning and Economic Development Hala Al-Saeed said the Government is planning to invest EGP 447 billion (28.4 billion US$) in 691 green bonds, which represents 14% of the total public investment for the 2020/2021 fiscal year. Additionally, the Government will increase the total public investment to 30% by 2021-2022 (MPED, 2020). Around 50% of the planned budget will go to greening public transportation and 30% towards greening the housing sector. Under this plan, EGP 9 billion are allocated for renewable energy investments - EGP 3 billion for the 2020/2021 fiscal year for the construction of the 250 MW wind power project in the Gulf of Suez and the Zaafarana solar PV powerplant with a capacity of 50 MWp (NREA, 2020).

1.2.2. Electricity infrastructure

The discovery of the record-size offshore Zohr gas reserve has revived confidence that Egypt will become a major energy hub for Europe, Africa, and the Middle East. Through its electricity interconnections, Egypt will be playing a pivotal role in electricity import and export. An interconnection is planned between Egypt, Cyprus,

and Greece. The project, known as Euro-Africa, is under commercial testing with a capacity of 2 GW for two submarines through a 1396 km subsea HVDC cable. The feasibility studies are expected to be completed in 2021 and the execution of the project is expected to finish in three years. Egypt is connected to Jordan and Libya and currently finalising a study for connecting to Iraq through Jordan. It is also developing an interconnection project with the Kingdom of Saudi Arabia that will reach a capacity of 3 GW over two construction phases. Construction on the second phase is expected to start construction soon following the award of the major execution contracts as both countries intend to exchange energy exports during peak load, and hence the business case may be less robust. The Egyptian Electricity Holding Company is currently in discussions over expanding the interconnection with Sudan from 80 MW to 300 MW. However, this project is mainly driven by political factors and is likely to be costly and high-risk.

With plans to expand its interconnections with Europe, Africa and the Middle East, Egypt is well-positioned to further exploit its potential in energy production and liberalise its market. In 2015, the Government adopted the Electricity Law 87/2015 introducing structural reforms to liberalise the electricity market over the eight years until 2023 (extended to 2025 due to the economic impact of the COVID-19 pandemic). These included restructuring the Ministry of Electricity and unbundling the Egyptian Electricity Transmission Company (EETC), allowing grid access for third parties without bias, and assuring the independence, competency, and accountability of the electricity regulatory agency. However, as of yet, none of these actions have taken place and there remains little to no sign of any true liberalisation of the electricity market in Egypt in the short-term.

Although IPPs have been allowed to enter the market, the electricity sector remains dominated by state-owned entities under the umbrella of the Egyptian Electricity Holding Company (EEHC). Under the Renewable Energy Law, 2014, investors can enter into agreements with private generation companies to purchase electricity from renewable sources, through an IPP model. This mechanism is still in its early stages as there are currently no incentives other than fixed electricity prices in the long-term. Nevertheless, it has become particularly appealing for energy-intensive industries.

When it comes to the operation and maintenance (O&M) of renewable projects, Egypt amended the law establishing the New & Renewable Energy Authority (NREA) to allow it to create O&M companies, by itself or in partnership with the private sector, for renewable energy projects. The amendments aimed to entice investors to enter public-private partnerships with the NREA, aimed at achieving the policy aims of the electricity sector.

1.2.3. Stakeholders, tariffs and regulatory framework

The main stakeholders in the electricity market include:

- **MOERE**: The Ministry of Electricity and Renewable Energy is responsible for setting policy under the direction of the Supreme Council of Energy, which is responsible for energy strategy. The ministry is also responsible for the security of supply.
- **NREA**: New and Renewable Energy Authority, established in 1986, is the national focal point in terms of the development of renewable energy technologies and solutions. NREA plans and implements renewable energy projects.
- **EETC**: Egyptian Electricity Transmission Company is the transmission system operator and is the single buyer within a vertically integrated national market.
- **EEHC**: Egyptian Electricity Holding Company currently owns most of the companies in charge of electrical power generation and distribution. It supervises and implements projects in these sectors. Its role is expected to diminish as most new power generation assets, especially renewables (as well nuclear), will no longer be owned or operated by EHHC.
- **Electricity Production Companies**: In Egypt there are six electricity production companies operating in the Cairo, East Delta, Middle Delta, West Delta and Upper Egypt regions. There is also one company, devoted to hydro-power plants, that operates nationally. All of the electricity production companies sell their electricity to the Egyptian Electricity Transmission Company and to the numerous distribution companies in Egypt. They are also responsible for the implementation of power plant projects that are approved by the EEHC's board of directors.
- **Distribution Companies**: Egypt has nine electricity distribution companies that serve North Cairo, South Cairo, Alexandria, Canal, North Delta, South Delta, Beheira, Middle Egypt and Upper Egypt. They purchase electricity from the Egyptian Electricity Transmission

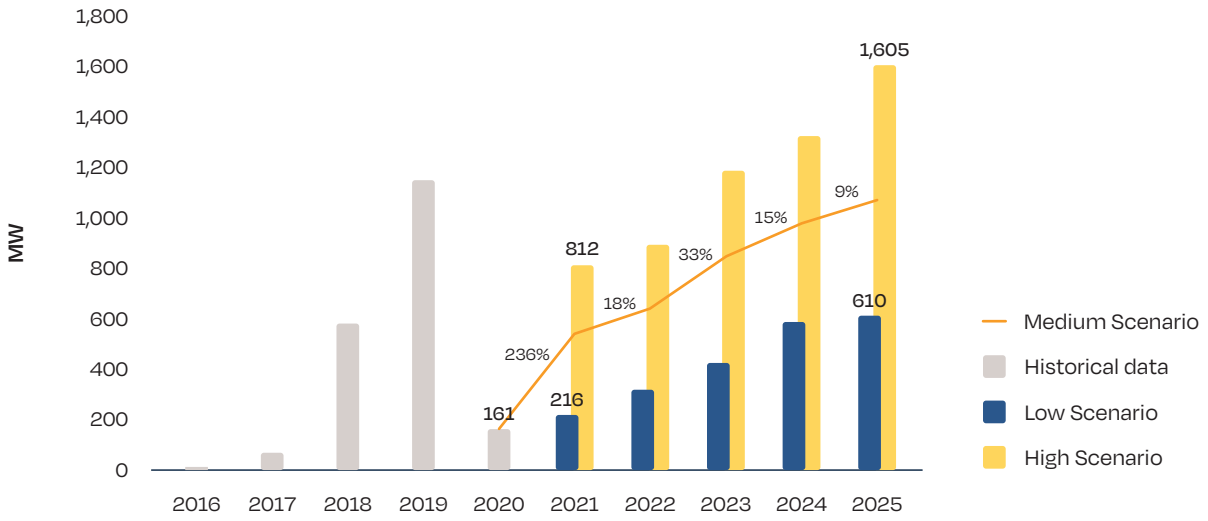
Company, and directly from the electricity production companies, for distribution in their regions. They also manage, operate and maintain the medium and low voltage networks of the EEHC, preparing forecast studies on loads and energy and economic and financial forecasts. They are also in charge of managing, maintaining and operating generation units that are not connected to the national grid.

- **EgyptERA** is the Electric Utility and Consumer Protection Regulatory Agency that organises, follows up, monitors, and develops all the electricity activities, including electricity production, transmission, distribution and consumption. It is responsible for setting the wheeling fee for national grid use and updates it every two years. The Agency also aims to preserve the environment. It seeks to attract investments within a framework of free, legitimate competition and without prejudice to the interest of the consumers and the other electricity utility stakeholders. It provides information without favouritism and acts within a framework of equality and free competition.

Other than the established players above, there are also three Independent Power Producers (IPPs), one wind-generating, and one hydro-generation company under the direction of the New Renewable Energy Authority (NREA) within the Ministry of Electricity and Energy (MOEE). Under the Electricity Law, production, distribution or selling of electricity requires a licence from the Electric Utility and Consumer Protection Regulatory Agency (EgyptERA). Furthermore, as the regulator, EgyptERA can unilaterally issue regulation requiring a minimum capital threshold as a precondition for granting licences to energy projects. It previously did this for FiT projects in 2017, when it required 15 million EGP minimum capital from lenders. Where the EETC is the off-taker under a Build-Own-Operate (BOO) scheme, an off-taking agreement must be signed between the EETC and the power producer. IPPs operating under the BOO model also need a land allocation agreement (where applicable). Private companies involved in power distribution (normally with in the residential or C&I segments) require a licence from EgyptERA, which sets the requirements that companies must comply with.

As part of the 2020 amendment to the 2015 Electricity Law, the Government committed to fully remove electricity subsidies by 2025 - which in 2020 lowered it to 0,6% of national GDP compared to 3,6% in 2017 (IMF, 2020). The initial goal was to completely remove subsidies by 2019 but this deadline has been postponed several times from to 2021 to 2025 to reduce inflation of one of the main consumable commodities and the impact of the COVID-19 pandemic. The 2020 annual ministerial decree set new

FIGURE 3 EGYPT ANNUAL SOLAR PV MARKET - HISTORICAL DATA AND FORECAST FOR THE UPCOMING 5 YEARS



SOURCE: SolarPower Europe, 2021.

electricity tariffs until 2025, raising electricity prices for homes by 19,1% compared to 2019.

1.2.4. Update on solar market demand

Egypt's annual market reached GW-scale in 2019 with around 1.2 GW of new installations, bringing its total capacity to 1.8 GW. As the country recovers from the COVID-19 pandemic, annual market growth is expected to rise steadily once more. In SolarPower Europe's medium scenario, the market is due to re-enter the GW-scale by 2025, installing a further 1.1 GW of solar capacity. This is accompanied by strong double-digit growth between 2021-2025. However, according to SolarPower Europe's high scenario, the market could become GW-scale as early as 2023 with 1.2 GW of installations forecast (SolarPower Europe, 2021).

In 2019 renewable sources accounted for just under 10% of the country's electricity mix showing that there is a long way to go for Egypt to meet its 2022 target of 20%. Over the last decade, Egypt has launched several auctions for large-scale solar: 200 MW of solar PV in 2013; 200 MW solar PV and 100 MW CSP in 2015; and 600 MW of solar PV in 2017. Auctions are carried out under state-owned EPC contracts with the NREA or under a Build Own Operate (BOO) scheme with an IPP through PPA agreements with EETC (IRENA, 2018). In 2020, Egypt approved renewable projects for a total investment of 1.8-2.2 billion US$: 500 MW PV with Al Nowais, 200 MW PV with ACWA power. The 200 MW solar PV plant Kom Ombo won by ACWA Power under a 25-year PPA agreement and network connection contract (Scully, 2021) offered a tariff of 0.0248 US$/kWh. This tariff was bettered by Al Nowais for the 500 MW PV at 0.02 US$/kWh, becoming the lowest tariff in the region. The Government is currently launching tenders for CSP for 50 MW and 600 MW to be developed in the west bank of the Nile.

1.3. Recommendations

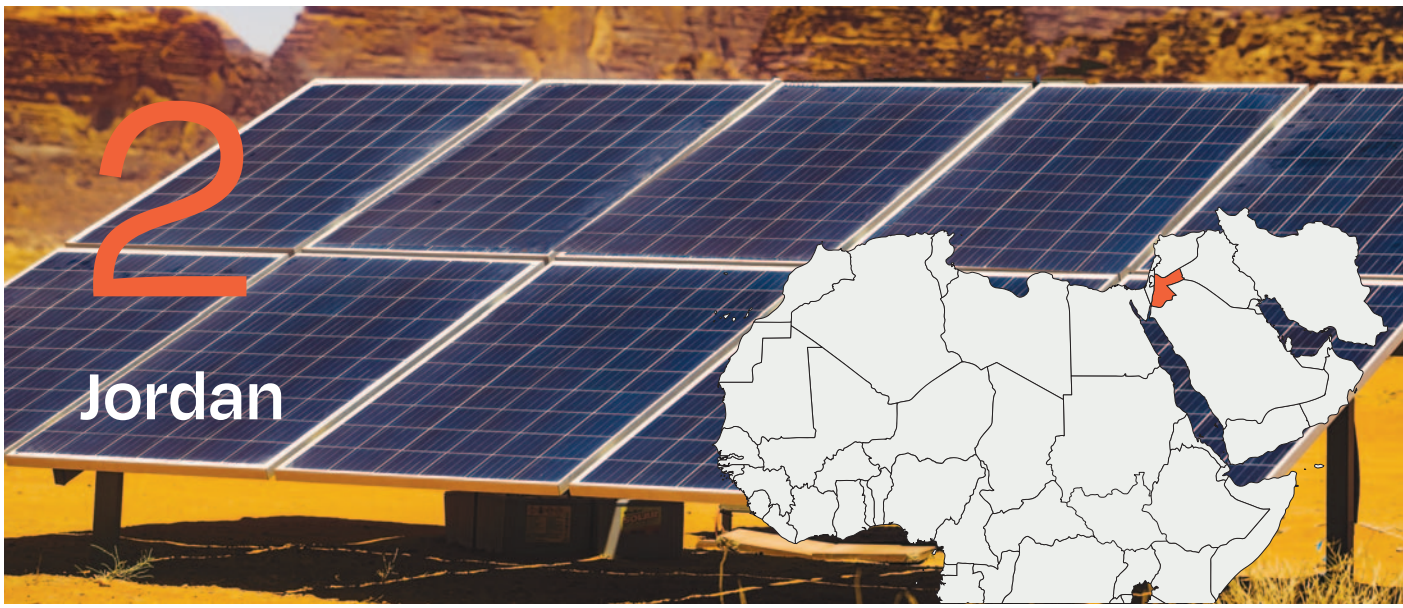
To achieve its aim of producing 55% of its electricity from renewable sources by 2035 and 61% by 2040, **further reform is required in Egyptian transmission and distribution capabilities.** Outdated transmission and distribution networks continue to cause interruptions. Whilst we welcome the government's 1.5 billion US$ investment between 2019-2020 and its plans to spend 760 million US$ in 2021, further concerted action and grid upgrades will be required to reduce the electricity loss from poor-performing transmission and distribution lines. Grid upgrades will also ease the integration of renewables.

Consider addressing the current overcapacity in energy production by adopting measures both on the demand and supply side. Moreover, overcapacity may be an opportunity to accelerate the electrification of the HVAC and transport sectors, which is arguably the main obstacle to decarbonising the whole economy. As such, investing in a flexible domestic grid would be of crucial importance, with the view to integrate ever-growing share of variable RES in the energy mix. A host of solutions can be developed including introducing grid-level energy storage, backup dispatchable power, general grid reinforcements, storage and energy efficiency measures, distributed generation, data-driven smart technologies, and more integrated networks.

Consider developing a national plan for creating jobs in the renewable energy industry with particular attention to strengthening national capacity in solar PV, CSP and other renewable technologies. There is no national plan for job creation and the ISES does not address it. A national plan could include a specific set of actions comprising capacity building, education and training programmes and public-private partnerships to ensure a skilled workforce for the renewable energy sector in Egypt.

Consider reviewing the Integrated Sustainable Energy Strategy (ISES) to meet the growing energy demand. The current strategy runs until 2040 with updates every five years for the next 20 years. The update could take into consideration defining the electricity grid expansion plan, connection, and operation, taking into account the system flexibility and reliability, especially when it comes to accommodating higher shares of renewable energy.

Creating a corporate power purchase agreement (PPA) market that appeals to larger companies and investors. Currently, the corporate PPA framework is suited to smaller scale generation. To address this, Egypt should consider restructuring prices and eliminating subsidies. Larger PPAs would help meet the needs of energy-intensive consumers and speed up the country's green transition. In addition, the government should take bolder steps to liberalise the energy market by allowing third parties to access the grid and improving transparency, independence and competence in the sector. Fostering appealing PPAs, especially for energy-intensive consumers, can be a fruitful route for Egypt's renewable energy sources development.



Solar panel, Wadi Rum, Jordan. © Ms. Li/Shutterstock

TABLE 1 MACROECONOMIC DATA OF JORDAN

Language	Arabic (official), English
Capital	Amman
Currency	Jordanian Dinar
Surface area (2018)	89,320 km^2
Population (2020)	10.2 million
Population density (2020)	115 people/ km^2
GDP (2020)	43.7bn US$
GDP per capita (2020)	4.3k US$
GDP annual growth (2020)	-1.6%
MENA region GDP annual growth average (2020)	-4.0%
Unemployment rate (2020)	18.5%
Literacy rate (2018)	98%
Internet connections (% of the population) (2017)	67%
Mobile phone subscriptions per 100 people (2020)	68.5

SOURCE: World Bank Group, 2017, 2018, 2019 and 2020.

2.1. Economic, social and political context

2.1.1. Macroeconomic context

Jordan is in a unique position in the MENA region given its relative stability within an otherwise volatile region. It has benefited extensively from international financing. However, this belies several deep-rooted structural problems and Jordan's economy is characterised by low growth, high unemployment, and growing debt. Since 2018 the Jordanian government have adopted several reforms in attempts to change this dynamic. These include, reforming the laws governing Public-Private Partnerships, public procurement, and domestic revenue mobilisation. However, the slow implementation of these reforms means that their effect on the country's GDP is yet to be seen.

Jordan's economic fragility has grown as the effects of the pandemic make themselves felt. Jordan's economy contracted by 1.6% in 2020 and unemployment rose to 24.7% in Q4 2020. Jordan's economy relies heavily on travel and tourism, which provide 18% of GDP and total employment in the country. These sectors were hit particularly hard during the first wave of the pandemic and explain the

steep rise in unemployment. However, the shoots of recovery are beginning to show themselves as real GDP is expected to recover by 2% in 2021. Further growth is being held back by the slow vaccine rollout in the country and the anticipated delay in the recovery of the travel and tourism sectors (World Bank Group, 2021).

2.1.2. Business environment

According to the World Bank's Doing Business report, Jordan is 75th out of a total of 190 countries for doing business. There are several advantages to doing business in the country. Jordan scores particularly highly when it comes to getting credit and ranks fourth out of 190 countries surveyed. This is due to the extensive legal rights of borrowers and lenders through collateral laws and the protection of secured creditors' rights through bankruptcy laws. Similarly, credit information held by credit bureaus and registries is extensive and readily available, contributing to an enabling climate for getting credit.

However, there are also several drawbacks to doing business in Jordan. The country ranks 138th out of 190 for securing construction permits. This is largely due to the onerous bureaucratic processes involved and the relative expense of securing one. There are also a larger than average number of administrative procedures involved in starting a business, where Jordan ranks 120th (World Bank Group, 2020).

2.1.3. Political and social context

Geopolitically, Jordan is at the epicentre of a volatile region. Despite this it has managed to maintain a delicate balancing act thus far. However, with prolonged instability in the region, from both ongoing conflicts and the COVID-19 pandemic, its ability to resist this will be sorely tested. The cumulative toll of the war on Syria and the estimated 1.36 million Syrian refugees in the country has seen a reduction in Jordan's GDP growth by 1.6% even before the pandemic. Similarly, the growth in population led to increased pressure on health services and electricity provision. To mitigate these effects and better integrate Syrian refugees in society, Jordan implemented several progressive policies, including granting work permits for Syrians in agriculture, construction, retail, and manufacturing; providing free access to schools; and including refugees in the government's COVID-19 response and vaccination campaign.

There are also signs that the internal equilibrium in the country is coming under increasing pressure. There are two root causes to this, the slow pace of reforms and ongoing issues surrounding government accountability and corruption. In response to several corruption scandals the standard government response to public protest has been a reshuffle. This lack of continuity in leadership has meant that policy agendas are more incoherent in the country. Waning trust in the government, coupled with its response to the COVID-19 pandemic have undermined the Jordanian social contract to the extent that the parliamentary elections in late 2020 witnessed only a 29.9% turnout (World Bank Group, 2021).

2.2. Energy and electricity

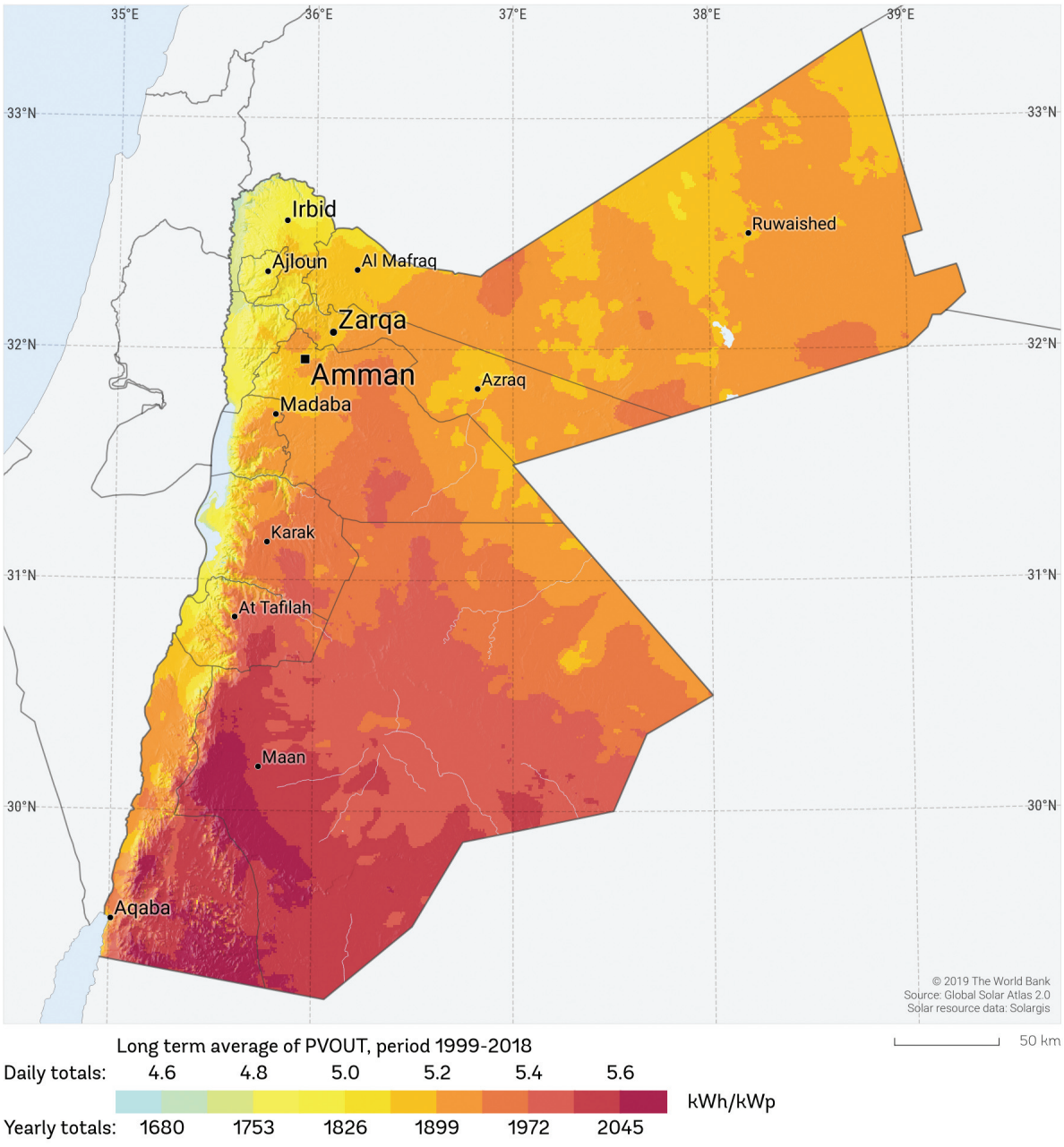
2.2.1. Energy sector situation

Jordan has a 100% electrification rate (World Bank Group, 2019). The lion's share of the country's electricity mix is taken up by gas (78.27% or 15.46 TWh), the renewables share is around 14%. Encouragingly for Jordan, the share of renewables in the electricity mix has been rising steadily since 2015, where their share stood at 1% (Ritche and Roser, 2020).

The country's energy mix is also dominated by fossil fuels. In 2019, 54% of the energy consumed in Jordan came from crude oil and products. This was by far the largest energy source, with natural gas having the second largest share of 35% of energy consumption. Renewable energy made up only 8% of the total energy consumption. Jordan only produces 8% of its energy requirements locally, meaning that it relies on imports to answer 92% of its energy demand (MEMR, 2019). According to 2017 data from the MEMR Jordan's electricity consumption stood at 17,547 GWh, with a per kapita electricity consumption level of 1,748 kWh. Electricity generation totalled 20,054 GWh and the rate of electricity losses within the system infrastructure was 13.1%. The peak load in 2017 was 3,320 MW (MEMR, 2017).

Jordan has two interconnections in the region, with Syria and Egypt. Given the region's volatility, Jordan is vulnerable to energy shortages and price fluctuations that harm its long-term energy security. In an effort to reduce Jordan's dependency on energy imports, the

FIGURE 4 JORDAN'S SOLAR PHOTOVOLTAIC POWER POTENTIAL

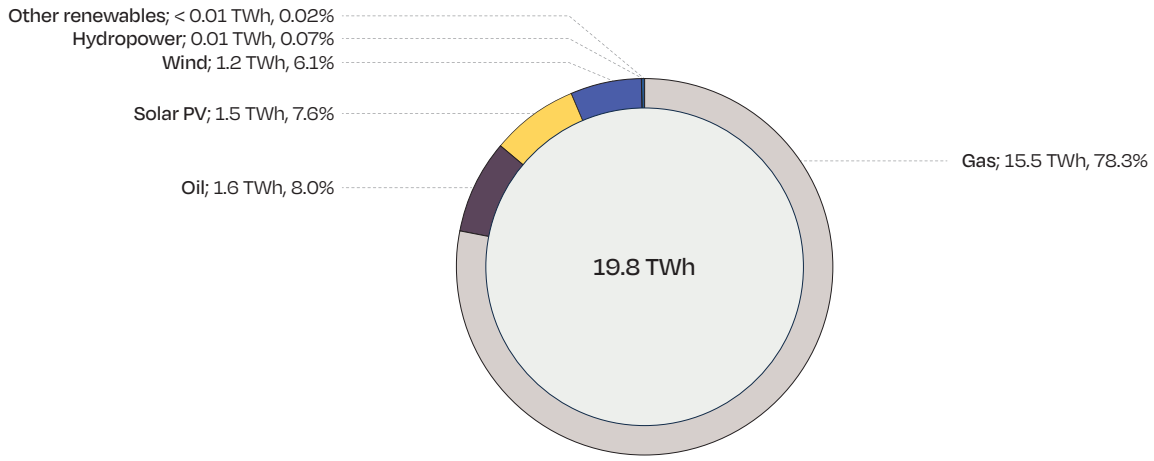


SOURCE: Global Solar Atlas 2.0, Solar resource data: Solargis.

government has been looking for ways to achieve energy independence. Geological evidence suggests that Jordan has an oil shale reserve of over 30 billion tons under its land. This led the government to sign four concession agreements with potential producers in 2019. Jordan also has significant uranium reserves that are largely untapped.

As far as renewable energy is concerned, there is some degree of opportunity in Jordan. The country had

FIGURE 5 JORDANS'S ELECTRICITY MIX IN 2019



SOURCE: Ritchie and Roser, published on OurWorldInData.org, 2020.

around 2.4 GW of installed renewable energy capacity in 2020 and through the *National Energy Sector Strategy 2020-2030* it plans to raise this to 3.2 GW (Almasri et al., 2021).

In terms of solar energy, Jordan has around 2 GW of installed capacity, making the largest renewable energy source by far. The country is located in the "solar belt" area between latitudes 25 N and 25 S which can mean up to 316 sunny days per year, with sunshine for an average of eight hours per day (MoEnv, 2020).

2.2.2. Electricity infrastructure

Jordan's power generation sector is made up of four companies: Central Electricity Generation Company (CEGCO); Samra Electricity Power Company (SEPCO); Amman East Power Company; and Qatrana Power Company. CEGCO came into being in 1999 when the vertically integrated state utility, NEPCO, was split into a generation company, a distribution company, and a transmission company. Originally CEGCO was state owned but in 2007 it was privatised, and the government sold off 60% of its share. CEGCO currently owns 1,555 MW of generation capacity, 49% of Jordan's total installed capacity. SEPCO is still entirely state owned and has 888 MW of generation capacity, 28% of Jordan's total installed capacity. The Amman East Power Company was the first IPP in Jordan when its 370 MW natural gas-diesel hybrid generation project began operating in 2008. The second IPP in Jordan is the Al-Qatrana Power Company which has been in operation since 2010. Its asset is a 373 MW natural gas-diesel hybrid generator as well. Both IPP projects in Jordan operate under a Build-Own-Operate model (NEPCO, 2013). Jordan's third IPP is currently the world's largest combustion engine powerplant with a 573 MW capacity and can run on natural gas, light fuel oil and heavy fuel oil. The plant is owned and operated by the Amman Asia Electric Power Company (Larson, A., 2015). Jordan's latest operational IPP is a 250 MW tri-fuel powerplant. It is designed primarily for operation at peaking, and it allows more flexibility in terms of fuel usage and dispatch. In 2019 a 46 MW solar PV park was retrofitted. The plant is owned and operated by AES Levant Holdings (Wärtsilä, 2021).

The only transmission system operator in Jordan is the National Electric Power Company (NEPCO). NEPCO is a totally state-owned company, and it acts as the power system operator, the transmission network owner, and the single off-taker from the generation sector. It is also responsible for planning and developing the power system, fuel procurement for power plant operations and providing oversight of the import and export of electricity with neighbouring countries. Finally, it contracts new generation capacity

to meet Jordan's steadily growing energy demand. The transmission network that NEPCO presides over consists of a main substation, with a total capacity of 10,023 MVA, which feeds high voltage transmission lines (above 132 kV and above) that cover 4,121 km of the country. Unfortunately, the stability of the national grid and its ability to integrate new, large quantities of renewables is a big concern. As a result of this, in 2019, the Ministry of Energy and Mineral Resources froze all renewable energy auctions of over 1 MW capacity. The aim of this was to study the grid's technical limitations and NEPCO is currently engaged in an extension and reinforcement project of the transmission network.

The distribution sector in Jordan is composed of three companies: Jordan Electric Power Company (JEPCO); Irbid District Distribution Company (IDECO); and Electric Distribution Company (EDCO). All these companies are privately owned and serve different regions of the country. JEPCO distributes in central Jordan, IDECO works in the north of the country, and EDCO is present in the south (NEPCO, 2013).

JEPCO is responsible for distributing electrical energy to almost 3 million people (nearly 66% of Jordan's total energy consumers) residing within Amman, Zarqa, Madaba and Al-Balqa. It operates a network of 19,000 km of lines that supply electricity to industry and during heavy loads at a voltage of 11/6.6 KV, and at 400 V for domestic consumers.

Since its establishment in 1997 till the end of 2007, EDCO was a public shareholding company, until Kingdom Electricity for Energy Investments (KEC) acquired 100% of the government's shares in 2008. It operates a network of 13,024 km of lines and supplies electricity to end-users at either 33/11 KV or 415V.

In 1957, IDECO was founded in Irbid distributes electricity to the governorates of Irbid, Jerash, Mafraq, Ajloun and some parts of Al-Balqa governorate. IDECO's concession area is about 23,000 km^2, constituting 26% of the Kingdom's area. In 2008, IDECO was privatised when KEC bought a 55.4% stake. It operates a network of 23,389 km of lines and provides electricity to end users at 33/11 KV or 415 V.

2.2.3. Stakeholders, tariffs and regulatory framework

Key stakeholders in the Jordanian electricity market include:

- **Ministry of Energy and Mineral Resources (MEMR)**: MEMR, under the control of the Minister, is responsible for policy making and setting the strategic direction of the energy sector.
- **Energy & Minerals Regulatory Commission (EMRC)**: EMRC's purpose is to advance regulation and competition in the energy and minerals sector to ensure that the interests of consumers and investors are protected. They seek to create a framework for the delivery of secure, sustainable, affordable, high quality, and durable services. An EMRC licence is required for projects over 1 MW capacity.
- **Ministry of Environment**: In the case of wheeling projects and rooftop solar, a permit is required from the Ministry of Environment.
- **Greater Amman Municipality (GAM)**: Renewable projects in the GAM's jurisdiction require an additional valid public works permit and a notarised guarantee that the public works permit will not be used for other purposes.
- **NEPCO**: The National Electric Power Company acts as the off-taker from IPPs and runs Jordan's transmission network.
- **JEPCO**: The Jordan Electric Power Company distributes electricity in the central area of Jordan.
- **IDECO**: The Irbid District Electricity Company distributes electricity in northern Jordan.
- **EDCO**: The Electricity Distribution Company distributes electricity in the south of Jordan.
- **EDAMA**: The Jordanian renewable energy association. They seek to maximise the business viability and potential in the energy, water and environment sectors and mobilise private sector actors in these areas.

There are two main statutes that govern the Jordanian electricity market, the General Electricity Law, and the Renewable Energy & Energy Efficiency Law. The General Electricity Law provides a regulatory framework for generating, distributing, and selling electricity. It also recognises energy efficiency as a national priority and give the EMRC authority to provide incentives to encourage the development of technological efficiency. Previous additions to the law allowed IPPs to access the electricity grid and set guidelines for renewable projects – small- scale

projects (less than 5 MW) are contracted through direct negotiations, and electricity from very small-scale projects (less than 1MW) for auto-generation can only be bought at peak demand (LSE, 2021).

The Renewable Energy & Energy Efficiency Law establishes the regulatory framework for encouraging the exploitation of renewable energy sources, furthering supply-side efficiency, and encouraging private sector investment in renewable energy. The law places MEMR in charge of enacting it and identifying geographic areas for renewable energy exploitation, allocating them via a tendering scheme. The law also makes provisions to allow project proposals for developing renewable energy installations on any land in the country and includes a general decision-making outline for the process. This legislation carries over many of the power purchasing arrangements from the General Electricity Law. However, crucially it does allow individual homes to produce and sell any surplus renewable energy back to the grid. Finally, the law also establishes the Jordan Renewable Energy and Energy Efficiency Fund (JREEEF) to support the development of renewable energy projects (LSE, 2021).

The implementation of the Renewable Energy & Energy Efficiency Law is supported by several bylaws, instructions and guidelines. Important among these is Bylaw No. 50 of 2015 and its 2016 amendment that sets the conditions and procedures for direct proposals for renewable energy projects. Similarly, Bylaw No. 10 of 2013 and its amendments from 2015, 2017, and 2018 details the tax exemptions for renewable energy and energy efficiency systems and equipment. The accompanying instructions include calculations for the cost of connecting renewable energy sources to the distribution system in the case of competitive bidding or direct proposals, instructions on the sale of electricity generated by renewables, instructions governing wheeling for energy from renewable sources, and a reference price list for calculating the prices for purchasing electrical energy from renewable sources. Guidelines related to the Renewable Energy & Energy Efficiency law include the interconnection of renewable energy sources on distribution and transmission grids, and on electric meters for net metering on both distribution and transmission grids (IRENA, 2021).

Finally, in the Intermittent Renewable Resources Distribution Connection Code at Medium Voltage, MEMR establishes the rules for projects interconnecting renewable energy with the transmission networks. The code also provides a contract for this (IRENA, 2021).

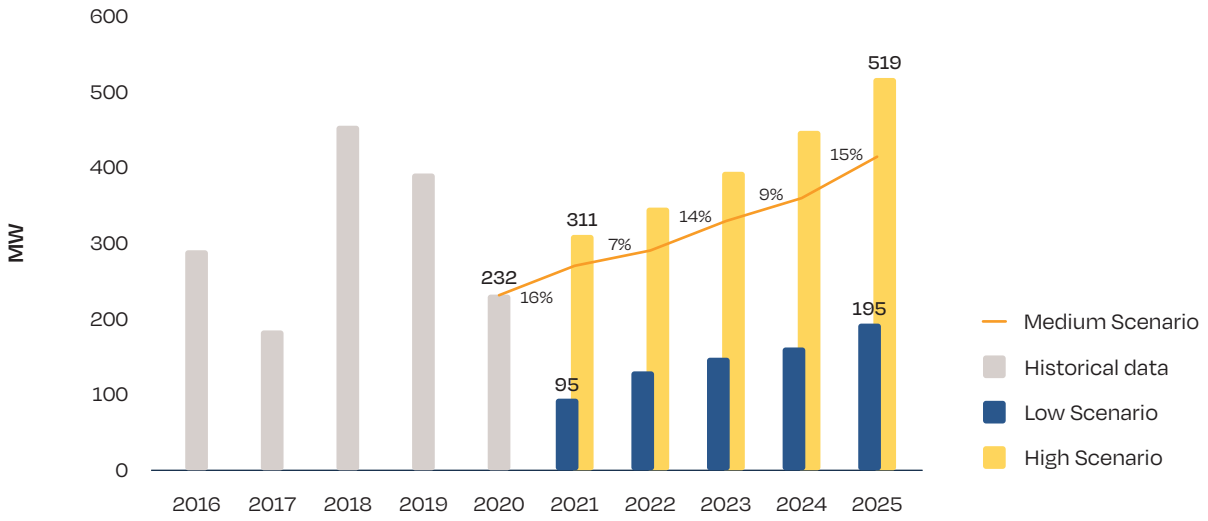
2.2.4. Update on solar market demand

In 2020, Jordan's total installed solar capacity reached 1.55 GW (SolarPower Europe, 2021), and this is due to grow steadily as the government set a target of having 31% share of renewables in the country's total installed capacity by 2030 in the National Energy Strategy for 2020-2030 (IRENA, 2021). According to SolarPower Europe's medium scenario, this should mean that the total installed capacity reaches 3.2 GW by 2025. However, more ambitious estimates in SolarPower Europe's high scenario place this figure at around 3.6 GW (SolarPower Europe, 2021). Ambitions for the growth of renewables in Jordan have recently taken a hit given the indefinite suspension of new projects above 1 MW since January 2019. This is mainly due to concerns over whether the integration of renewables into the grid would be possible beyond the existing pipeline for 2020.

Jordan has been developing a framework to encourage private sector investment in renewable energy projects since 2012, when its first round of direct proposal submissions was received. Whilst the first expression of interest included a feed-in tariff incentive, this changed to a competitive bidding process in the second round in 2013. The offer has progressively developed following lessons learned and the government have now taken additional steps to allay investors' concerns. These include a government-backed PPA to address off-taker risks, template contracts were included in the tender package including the PPA, Land Lease Agreement, Grid Connection Agreement, and the Government Guarantee Agreement. These have been accompanied by several preferential tax incentives, including 75% relief from income tax for the project company, for ten years; exemptions from customs and other duties, fees, levies, returns and taxes; exemption from stamp duties; and exemption from general sales tax. Projects realised through this route are usually built, owned, and operated by an IPP.

Jordan also has a large C&I and self-consumption market which benefits from a wheeling and net metering scheme. The wheeling scheme allows the

FIGURE 6 JORDAN ANNUAL SOLAR PV MARKET - HISTORICAL DATA AND FORECAST FOR THE UPCOMING 5 YEARS



SOURCE: SolarPower Europe, 2021.

user to install the energy generation facility away from the point of consumption and connect it to the transmission grid. Besides, commercial players, the wheeling system is also used to power refugee camps in Jordan (IRENA, 2021).

2.3. Recommendations

As Jordan recovers from the COVID-19 pandemic, **we recommend that it introduce measures to ease the financial burdens of renewable energy companies.** These measures would ideally reduce and reschedule income tax, and project and corporate licenses, including licenses for generation, companies, and professionals.

To further support Jordan's renewable energy sector, **we recommend introducing a reimbursement scheme for owners of renewable energy systems.** During the pandemic, NEPCO disconnected wheeling-based renewable energy systems, leaving the owners vulnerable to cost increases. In addition, several sectors were shut down and unable to benefit from the energy generated by their renewable systems. A reimbursement scheme would encourage continued investment in renewable energy systems.

To realise the ambition of a 31% share of renewables in the final energy mix, Jordan should **lay out a clear roadmap for achieving this.** The suspension of new projects over 1 MW since January 2019 has created uncertainty for investors and doubts about whether the government will be able to achieve its target. Only with concerted and coordinated policy action between ministries, distribution companies and municipalities can ensure the full integration of renewables into the grid.

To foster continuous growth of the renewables sector significant efforts should be made to **reduce risks and transaction costs of projects by shortening approval processes and timelines.** A fixed milestone-based project timeline will help with planning and encourage more private investment in renewable energy.

To solve uncertainty around the grid's ability to integrate higher shares of renewables, **significant investment is needed to strengthen and upgrade transmission and distribution infrastructure.** In the immediate future, Jordan should identify priorities for the distribution network, mobilise investments to spend on strengthening infrastructure and unlocking network capacity for integration of renewables. In the longer term, work in this area will involve assessing the power system's flexibility needs and coordinating with other stakeholders in industry, transport, water, and agriculture to determine current and future power requirements.

We also recommend establishing the priority dispatch of renewable energy sources to the grid. This would accelerate the growth of Jordan's renewable energy sector and improve the competitiveness of its energy sector, as wind and solar become more competitive against fossil fuels and gas.

Battery storage can provide an effective way of managing the grid. Ministers should consult with the system operator, distribution companies and other relevant stakeholders to **create a storage code for grid management at transmission and distribution levels.** This would provide regulatory certainty and help with the integration of more renewables. It will also provide more flexibility for renewable power, meaning it is able to respond during peak times. Moreover, the cost of this is competitive in comparison to other peak demand solutions.

To encourage the adoption of storage and avoid curtailment in tenders, **we recommend that tenders contain price-based strategies that suspend feed-in premiums during hours when prices fall below a certain threshold and demand is lowest**. This would ensure that innovative solutions to avoid curtailment would be deployed by renewable energy generators.

To further improve flexibility in the electrical system, **we recommend that Jordan develop a framework for the deployment of smart grid solutions.** This framework would promote the use of smart metres, inverters, integrated storage solutions (at grid scale and behind the meter), the use of real-time awareness, and dynamic line rating. This would improve forecasting and management of renewable energy generation, improving system efficiency and supply security.

Another way to improve flexibility would be to **accelerate the electrical interconnections with neighbouring countries.** This would stimulate demand for Jordanian energy and reduce the financial losses associated with overgeneration of renewable energy. This would also help NEPCO honour long-term PPAs and achieve its renewable energy targets.

To fully take advantage of Jordan's renewable energy potential, **we recommend a restructuring of the energy sector to make it a competitive market**. Any reform should aim to increase competitiveness within the generation and distribution sectors and improve flexibility within upcoming contracts through the use of short-term pricing methodologies. This market reform should be included in the 2020-2030 strategy.

To incentivise consumers to adapt their electricity demand, **we recommend that the COVID-19 recovery plan introduce time-of-use tariffs.** TOU tariffs reflect the cost of electricity at the time it is being consumed and improves grid flexibility.

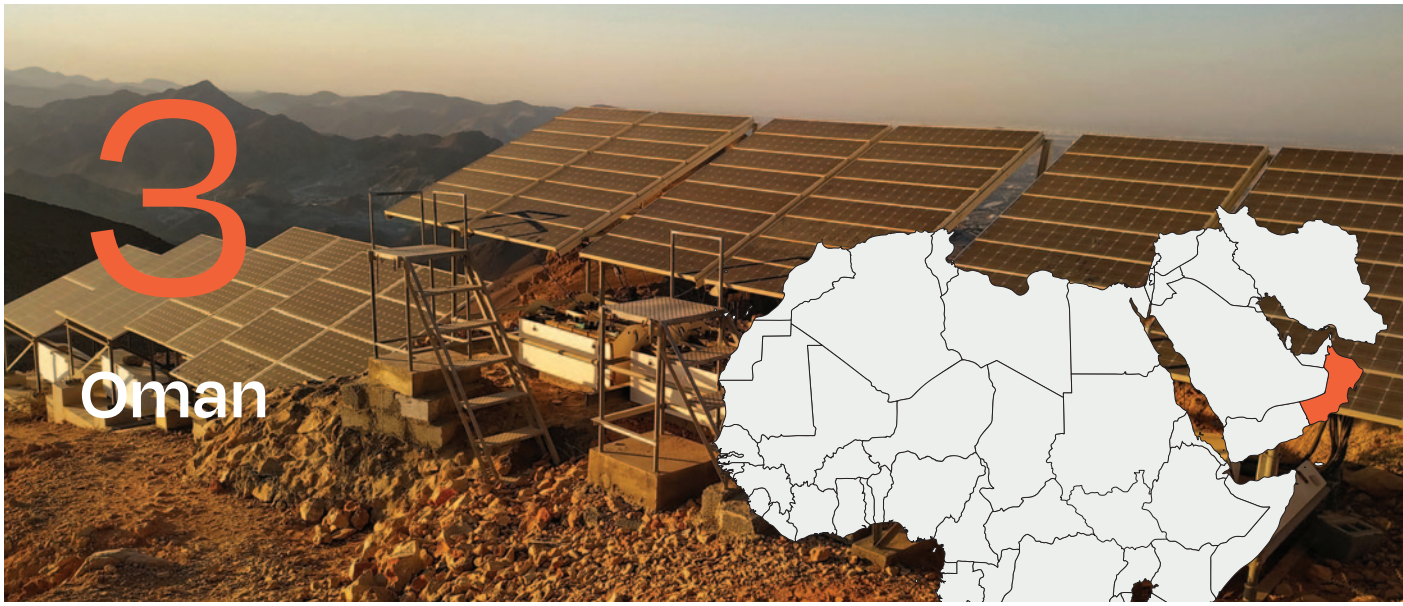
As one of the most fossil fuel intensive sectors, **energy diversification should be a priority for the transport sector**. The industry is Jordan's largest energy consumer and relies mainly on diesel and gasoline to satisfy its demand. This includes developing the charging infrastructure in the country with investment from the private sector.

Energy diversification in the transport sector should be combined with electrification efforts across a range of other areas. **We recommend mandating the electrification of HVAC, promoting the electrification of industry, and power the water sector entirely on renewable energy**. To achieve this Jordan should introduce a new heat bylaw and establish a long-term plan to provided financing to HVAC users, promote industrial decarbonisation through locally generated renewable energy and provide state guarantees on PPAs between renewable energy generators and industry, remove the suspensions on large-scale renewable energy projects and prioritise and reserve capacity and grid allocation for the water sector.

Investments in renewable energy are different to other sectors. They may require loans with a longer tenor or more lenient interest rates. **Building the capacity of local financing institutions and project developers** is key to boosting investment in renewable energy. With help from international finance institutions and more developed green finance units in local banks, there will be increased opportunity to take advantage of international finance and an improvement in the implementation of programmes under the JREEEF and the Central Bank of Jordan.

Growth in renewable energy comes hand-in-hand with increasing numbers of green jobs. **There should be significant efforts put into maximising renewable energy job creation**. To take full advantage of the increased deployment of renewables, policymaking needs to extend to industrial strategy, skills development and R&D. Particularly in the case of skills training to supply a growing industry, this will need to be coordinated between ministries, training institutes, universities, and industrial partners.

3 Oman



Saal mountain, Oman. © Sa83lim/Dreamstime

TABLE 1 MACROECONOMIC DATA OF OMAN

Language	Arabic
Capital	Muscat
Currency	Omani Riyal
Surface area (2018)	309,500 km^2
Population (2020)	4.45 million
Population density (2020)	16.5 people/km^2
GDP (2019)	76.33bn US$
GDP per capita (2019)	15.34k US$
GDP annual growth (2020)	-6.4%
MENA region GDP annual growth average (2020)	-4.0%
Unemployment rate (2020)	5%
Literacy rate (2018)	95.7%
Internet connections (% of the population) (2020)	95.2%
Mobile phone subscriptions per 100 people (2020)	134

SOURCE: World Bank Group, 2017, 2018, 2019 and 2020.

3.1. Economic, social and political context

3.1.1. Macroeconomic context

Oman, being an oil producing country, suffered a massive setback due to the dual shock of COVID-19 and oil price decrease, resulting in a 6.4% GDP decline in 2020, worse than the 4% drop for MENA region in general. The economic recovery is expected to be sluggish, with GDP growth rising to 1.8% by 2021. This is expected to put more stress on government spending, business, and consumer spending, along with elevated public debt. Public debt has already risen to 81% in 2020 from 60% in 2019 (35% increase) (IMF, 2020).

Oman's key risk lies in its heavy oil dependence (nearly 40% of GDP and up to 85% of government revenue on average, depending on fluctuations in commodity prices), even though there have been efforts from the government to diversify into non-oil sectors and gas in the past decade. The oil prices and the revenues directly impact government spending, public wages, and subsidies; hence oil shocks resonate across all economic sectors in the country. As a result of the economic impact, S&P Global Ratings downgraded Oman's long-term sovereign credit rating to B+ from BB- due to the projected material deterioration of public sector finances over the next three years, as

indicated by the country's rising net debt level. This directly affects international lending and credit quality in the country.

The share of activities in the economy are divided mainly into Agriculture (2.5%), Industry (46%) and Services (~52%) where employment by sector is 4%, 33% and 63% respectively. Agricultural output is mainly dates, limes, and bananas, limited varieties owing to lack of fertile land and the harsh climate. The manufacturing sector alone is estimated to contribute to 10% of GDP. The services sector includes mainly oil related activities, but logistics (maritime transport) and financial activities are also on the rise. In the efforts to diversify the economy, according to the 10th Five Year plan of the government from 2021-2025, the sectors to play a key role in the economy are Manufacturing & Industries, Transport & Logistics, Tourism, Fisheries, Mining, and Education. They will be pivotal in delivering the 3.5% GDP annual growth rate, targeted by the Omani government (Prabhu, 2021). The main objectives for the country remain diversification, industrialisation, and privatisation. The development of the industrial sector allows for not only diversification and self-reliance but also to generate increased employment opportunities.

3.1.2. Business environment

In terms of business environment, the World Bank's Doing Business 2020 report ranks Oman 68th out of a total of 190 countries (same as 2019) with an overall score of 70. There are several advantages to doing business in the country. Oman scores particularly highly when it comes to starting a business (32nd). This is mainly due to the short amount of time and relatively light bureaucratic procedures required to establish one. In fact, Oman scores higher than other comparable economies such as Saudi Arabia (38th) and Jordan (120th). The country also scores well when it comes to accessing electricity (35th) where, despite having more procedures to follow than the rest of the MENA region, securing a connection takes roughly half the amount of time, is relatively inexpensive, and is far more reliable. The only comparable economy to beat Oman in ease of accessing electricity is Saudi Arabia (18th).

The key obstacle to doing business in the country is the difficulty of getting credit. Here Oman ranks 144th out of 190 countries. Its poor score is explained by the lack of legal rights afforded to creditors, primarily there is no legal framework that governs secured transactions. This is also no guarantee that creditors will be paid first if a business defaults outside an insolvency procedure or if a business is liquidated (World Bank Group, 2020).

3.1.3. Political and social context

After the death of Sultan Qaboos bin Said in January 2020, Oman's ruler for nearly half a century, Sultan Haitham bin Tariq Al Said took over the reins to navigate the country through the COVID-19 crisis. Several royal decrees were issued to restructure the government, reduce bureaucracy, and increase the effectiveness of the policymaking process. The country has a relatively high standard of living and a light tax burden. Oman's relations with neighbouring countries as well as US, UK, India, and China are positive.

According to estimates, unemployment rate rose to 5% in 2020, the highest in 30 years with almost half of the Omani youth workforce unemployed. The private sector has not satisfactorily been able to provide opportunities for employment of the youth, mainly due to educational mismatches, pay gaps and market regulations. Since almost two million jobs are currently held by migrant workers (NCSI, 2020), the government has put a lot of effort into promoting local employment, sometimes at the cost of placing limitations on the number of foreign workers in the country.

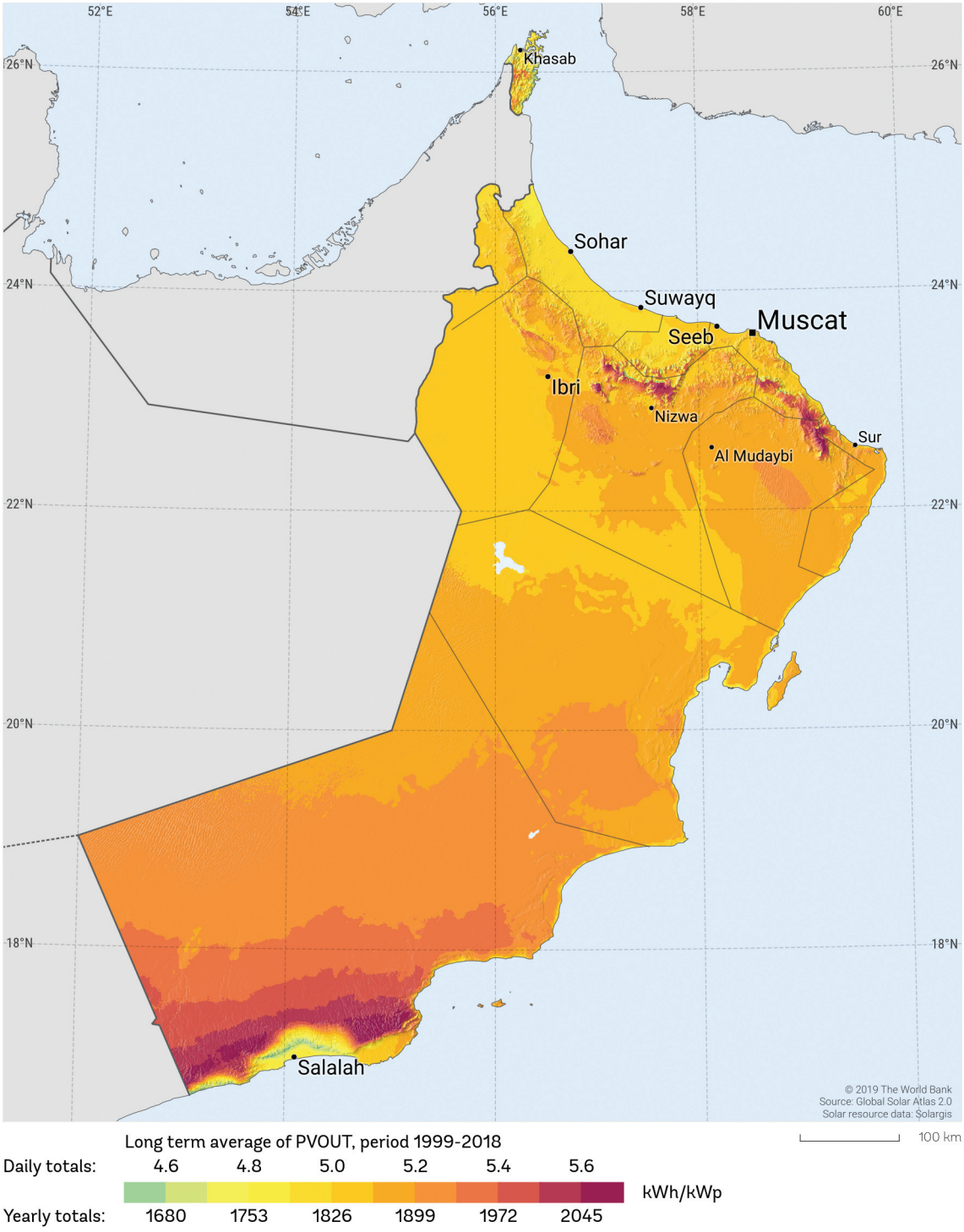
3.2. Energy and electricity

3.2.1. Energy sector situation

Oman's highest solar PV potential is concentrated on its south coast, near the city of Salalah, at over 2,045 kWp/year (Solargis, 2018). However, the country is yet to make use of this as its electricity mix is almost exclusively dominated by gas, with less than a 0.01% share of solar (Ritchie and Roser, 2020). Nearly one quarter of Oman's domestic natural gas production (32.3 billion m^3) is used to power electricity generation and water desalination plants. Electricity production comes mostly from gas power plants, which represent more than 99% of Omani electricity production. Total electricity production increased to 33,796 GWh in 2019 from 33,547 GWh in 2018. Peak demand historically grew at an average of

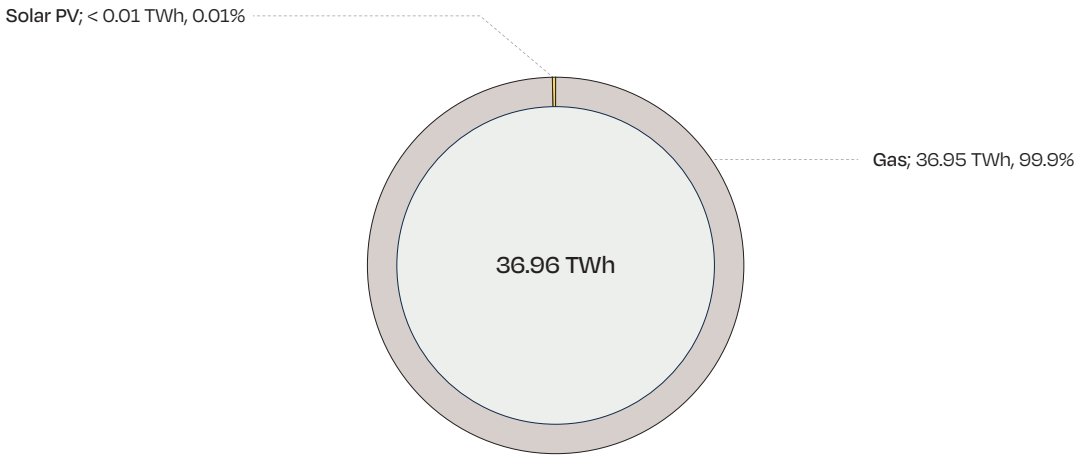
3 Oman / continued

FIGURE 7 OMANS'S SOLAR PHOTOVOLTAIC POWER POTENTIAL



SOURCE: Global Solar Atlas 2.0, Solar resource data: Solargis.

FIGURE 8 OMANS'S ELECTRICITY MIX IN 2019



SOURCE: Ritchie and Roser, published on OurWorldInData.org, 2020.

7% per year, while average demand grew by 9% annually in the period 2005-2018 (OPWP, 2019). In terms of projections, the base case considered by national utility Oman Power and Water Procurement Company (OPWP) is an average demand growth by 5% from 2019-2025 (OPWP, 2019).

3.2.2. Electricity infrastructure

In the efforts to privatise the electricity sector, the private sector now owns 100% of generation capacity in Oman's Main Interconnected System (MIS), and efforts have started to privatise other network companies involved in transmission and distribution activities. If implemented, Oman will be the first country in the Middle East region to have privatised its electricity transmission and distribution sectors.

Oman has a forecast peak demand increase of more than 50%, reaching 9.96 GW by 2023. In terms of network connectivity, the Dhofar region is not yet fully integrated with the MIS grid in the north. OPWP expects a new 400 kV transmission line to be completed by 2023, linking the MIS to the Petroleum Development of Oman's (PDO) power system and to the developing industrial hub at Ad Duqm, which will be ultimately extended to Dhofar. This will enable full integration of capacity planning and operations, achieving significant operational efficiencies and financial benefits.

The existing regional interconnection with UAE has limited transfer capacity and provides access to other GCC countries' power systems through UAE's national grid. A direct transmission line between Oman and Saudi Arabia will eventually reduce the reliance on UAE's grid for future electricity exchanges with GCC countries.

In Oman power generation has largely been privatised and there are currently 15 generating companies operating in the sector. The oldest of these companies is the United Power Company SAOG, which began operations in 1996. The company is 40% publicly owned and operates a 270 MW gas-fired combined cycle power plant. The company's PPA with the Oman Power and Water Procurement (OPWP) company is due to finish in January 2025 (UPC Oman, 2021). The Dhofar Generating Company owns and operates the Salalah IPP project in the Dhofar Governorate. The project consists of two plants with a combined capacity of 718 MW or 62% of the entire capacity of the Governorate's power system. Their PPA with OPWP matures in January 2033 (DGC, 2021). The Barka 1 IPP was the first IPP to be developed as part of the Omani government's privatisation programme. The 427 MW gas-fired power plant began operations in 2003 and provides 6% of the electricity in Oman. It has a 19 yar PPA with OPWP on a build-own-operate model (ACWA Power, 2021). Another of the original wave of IPPs is

the Al Kamil Power Company SAOG, which owns and operates a 285 MW plant in the Sharqiyah region of Oman (Al Kamil Power Company, 2021). Other notable IPPs in the country include the Al-Rusail Power Company SAOC, which owns and operates a 665 MW plant and recently began commercial operations at a new plant in Barka which produces 678 MW of power in combined cycle and 363 MW in open cycle (SMN Power, 2021). The Sohar Power Company SAOG owns and operates a 585 MW capacity power plant in the Al Batinah region of Oman (Sohar Power, 2015). The Phoenix Power IPP owns Oman's largest operating power plant with a capacity of 2000 MW. It contributes 21% of the total capacity contracted by MIS and is a cornerstone of the country's power infrastructure (Phoenix Power Co, 2017).

The OPWP is currently a monopolistic bulk buyer and seller of Oman's electricity and associated desalinated water (OPWP, 2019). It is a wholly owned subsidiary of Nama Holding and is mandated with managing production capacity to meet electricity demand, forward planning, and procuring ancillary services in coordination with the Oman Electricity Commission Company (OETC). The OPWP buys power from the electricity generators through power purchase agreements (PPAs). The contractual arrangements for power delivery under these PPAs can be differentiated as firm capacity, reserve sharing, non-firm capacity, and energy-only.

Transmission is handled by the Oman Electricity Transmission Company (OETC), which owns and operates the 220 and 132 kV transmission system that serves the Main Interconnected System. The OETC connects eight main power plants in the country and transmits power over 220 kV and 132 kV, stepping down to 33 kV for distribution (OPWP, 2016).

The distribution sector is made up of three closed joint stock companies that operate in different areas of the country. The Muscat Electricity Distribution Company (MEDC) operates in the Muscat region of the country and is responsible for the distribution of electricity in this area. Its other responsibilities include the building and maintaining of distribution infrastructure. The Mazoon Electricity Company (MZEC) operates in Dakiliya, Sharqiya and the South Al-Batinah regions. The Majan Electricity Company (MJEC) operates in the North Al-Batinah and Al-Dahirah regions and the Buraimi Governorate. It is worth noting that the MIS does not yet cover the entire country. For those areas that fall outside the MIS and the Salalah system, the Rural Electricity Company (RAECO) distributes power from diesel generators to them. It is also responsible for progressively electrifying rural areas (OPWP, 2016).

In July 2018, it was reported that OPWP was working towards a pilot spot market for electricity, ahead of commercial operation. The new spot market would reportedly operate alongside the existing system of long-term PPAs and power- and water-purchase agreements. The pilot would be implemented only on the MIS. OPWP stated that the new market would increase competition among power generating companies and create a market for fresh capacity that might not otherwise be absorbed by existing PPA channels. All existing electricity producers will have the option to join the spot market when their current contracts expire (OPWP, 2018).

In the new requests for proposals for solar PV projects, it is reportedly mandatory to publicly list some minority percentage of shareholding of the projects five years after the commercial operating date.

The proposed electricity spot market will only apply to power generation and will not cover the purchase of electricity by customers or distribution companies who will continue to purchase power from OPWP at the Bulk Supply Tariff.

3.2.3. Stakeholders, tariffs and regulatory framework

There are several key stakeholders in the Omani electricity market:

- **Public Authority for Electricity and Water (PAEW):** The PAEW is responsible for securing the electricity supply to all areas of Oman and encouraging private sector investment in the electricity and desalinated water sectors.
- **Authority for Public Services Regulation (APSR):** The APSR is the regulatory authority of the electricity and water sector. It is also responsible for the ongoing privatisation of the generation sector. It monitors the market and acts to ensure fair competition when procuring new generation capacity. It issues licences for projects in the electricity and water sectors and monitors PPAs to ensure that they are respected.

- **Electric Holding Company (EHC)**: The EHC is a state-owned entity and holds shares in nine companies engaged in the generation, transmission and distribution of electricity and water. It supports the implementation of the government's privatisation agenda in the electricity sector. It also provides financial accounting services and funding to government-owned companies in the sector.
- **Oman Electricity Transmission Company (OETC)**: The OETC is responsible for electricity transmission in the MIS.
- **MEDC**: The Muscat Electricity Distribution Company operates in the Muscat region.
- **MZEC**: The Mazoon Electricity Company operates in the Dakiliya, Sharqiya and South Al-Batinah regions.
- **MJEC**: The Majan Electricity Company operates in the North Al-Batinah and Al-Dahirah regions and the Buraimi Governorate.
- **RAECO**: The Rural Electricity Company operates in areas outside the MIS and Salalah system and is responsible for rural electrification.

Electricity prices in Oman are set centrally and are uniform across the country. Despite making significant progress in unbundling and reforming the electricity sector, retail tariffs are still subsidised. Government subsidy in the electricity market is estimated to stand at an average of 30%. The prices have also been low because of the low cost of fuel used for electricity generation as natural gas is sold domestically for lower than the price of natural gas on the international market.

Oman has developed a strategy to introduce tariffs for industrial users that fully reflects generation and other costs. In October 2016, the regulatory authority announced that it was hiking power prices for 10,000 industrial and commercial users, to reflect Cost Reflective Tariffs. The hikes for corporate users took effect in January 2017.

More recently, in January 2021, a new hike (minimum rise 40% for commercial users) was introduced in an effort to remove subsidies gradually (100% removal by 2025). The slabs are as described below:

1. Cost-reflective tariff (CRT) is applicable to all large consumers (except residential) with a consumption in excess of 100 MWh/year. It contains 4 components: Total Cost = Bulk Supply Charge + Transmission Charge + Distribution System Charge + Supply Charges.
2. Remaining non-residential category, will all be grouped into one category including industrial, commercial, government, and tourism.
3. The agricultural and fishery sectors will continue to have a special tariff.
4. Residential sector.

Despite the changes in 2017, only 57% of the overall economic cost of supply of electricity was recovered from customers through retail tariffs in the MIS. The remaining 43% of the revenue requirement came in the form of direct government subsidy. In 2017, electricity demand from large industrial customers and government users decreased by 2.6% and 1.3% respectively compared to the previous year, due to the implementation of cost-reflective tariffs in these two customer categories.

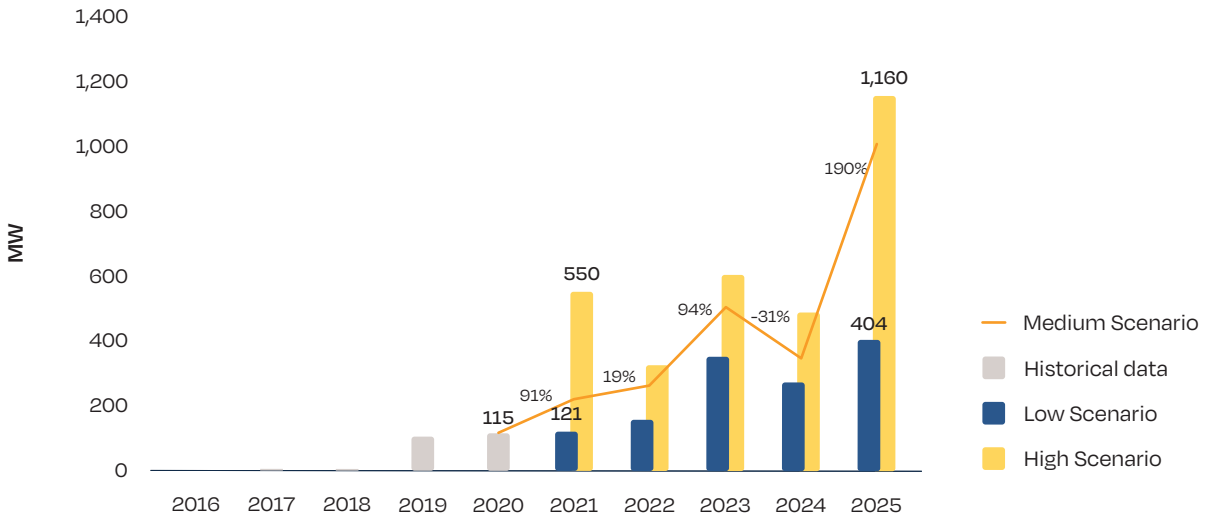
The main law applicable for development of renewable energy projects is the Regulation and Privatisation of the Electricity and Related Water Sector as promulgated by Royal Decree No. 78/2004 (the "Sector Law"). It does not specifically address renewable energy power generation but all types of privately developed power plants. However as per reports, the APSR is working on a dedicated renewable energy regulatory framework.

3.2.4. Update on solar market demand

In 2020 Oman had a cumulative installed solar capacity of 225 MW and its annual market has seen relatively modest growth to date, with its biggest annual installation totalling 115 MW in 2020. Whilst the market is set to grow, it will not reach GW-scale until 2025 according to SolarPower Europe's medium and high scenarios (SolarPower Europe, 2021). The original target of 10% of electricity to be produced from renewable sources was set for 2020. However, they were subsequently revised (as of January 2020) to 2025, increasing to 30% by 2030 (MESIA, 2021).

This target is planned via several OPWP tenders. The largest of the awarded tenders is the IBRI II solar PV plant project, which will add 500 MW of solar cpapcity, and was won by a consortium led by ACWA Power. The

FIGURE 9 OMAN ANNUAL SOLAR PV MARKET - HISTORICAL DATA AND FORECAST FOR THE UPCOMING 5 YEARS



SOURCE: SolarPower Europe, 2021.

project acheived financial close in 2020. The 105 MW Amin Solar project was awarded to Marubeni and was commissioned in 2020. There are currently two large-scale open tenders, Manah I and Manah II, which together represent over 1 GW of additional solar PV capacity. Bids for these are due shortly and the OPWP has planned a further 600 MW tender through its Power 2022 programme and a further 700 MW one through the Power 2024 programme (OPWP, 2019).

While the OPWP projects have moved on with relative success, the hybrid project tender issued by Tanweer for 11 rural sites with solar-hybrid systems has been under development for over two years. Of the 14 pre-qualified bidders, only one, EDF, submitted a proposal (Informa Markets, 2020). Feedback indicated that the main obstacle was the logisitcal difficulties of managing large portfolios.

With the country also being a focus of Green Hydrogen efforts, large scale execution of solar projects is envisaged. As per recent announcements, the state-owned oil and gas company OQ, the Hong Kong-based renewable hydrogen developer InterContinental Energy and the Kuwait-based energy investor Enertech are planning to build a green hydrogen plant powered by 25 GW of solar and wind capacity (Paddison, 2021).

Subsidised tariffs have meant that the C&I segment has grown slowly as the savings are modest. However, the Sahim II programme, which targets rooftop projects in Muscat, aims to cover up to 30% of buildings with rooftop PV. This translates into roughly 250,000 rooftop installations or around 1 GW of solar capacity by 2025-2030. The pilot batch of Sahim will target 3000-5000 houses in Muscat and aim to reach 100,000 houses covered by 2023 (Sarac and Podgore, 2021).

3.3. Recommendations

As the country recovers from the economic shock of the COVID-19 pandemic, there are several recommendations that would help speed up the development of projects.

Although Oman has a comprehensive regulatory framework in place, there are several areas that pose challenges for the nascent renewables sector in the country, such as the lack of statutory definition of renewables or clean energy; Similarly, the Sector Law does not make specific provisions for solar and defines generation very broadly as the production of electricity by any means. **We recommend giving renewables a separate status and empowering the regulator to propose specific programmes to target**

the growth of renewables. The regulator should also be able to propose amendments to the existing laws and introduce strategies such as wheeling or bilateral trading of electricity. Creating specific legal provisions for renewables could also include the granting of more regional power licences. This would lead to increased competition and decreasing costs of energy production.

A further limit on the development of renewables is the ability of the national grid to absorb new capacity. To further develop its renewables market, **we recommend that funds and programmes for national development be directed towards strengthening and upgrading the national grid infrastructure**.

Currently Oman faces issues around access to project financing. This is due to several unfavourable downgrades by credit rating agencies on one hand, and a lack of experience in operating in the country on the part of commercial banks, on the other. Risk of default remains low, barriers to investment are limited, and the growth potential of the country is very high, as highlighted by this report. **We recommend that DFIs, impact funds, and other finance providers use this report as a basis for developing a proper understanding of the Omani context** and the opportunities it offers in long-term visibility in the renewables space.

Subsidies for fossil fuels are particularly high in Oman. Despite solar PV's unrivalled levelised cost of electricity, the market distortion from subsidies, and the lack of a legal framework for bilateral electricity trading (as in C&I or distributed generation sectors) make the country less attractive to potential investors. Currently the target date for removing subsidies entirely is 2025. **We recommend that this date should be considered as the latest possible moment for ending subsidies**. This would help developers and key stakeholders in the renewable energy market to immediately start planning a development strategy in Oman.

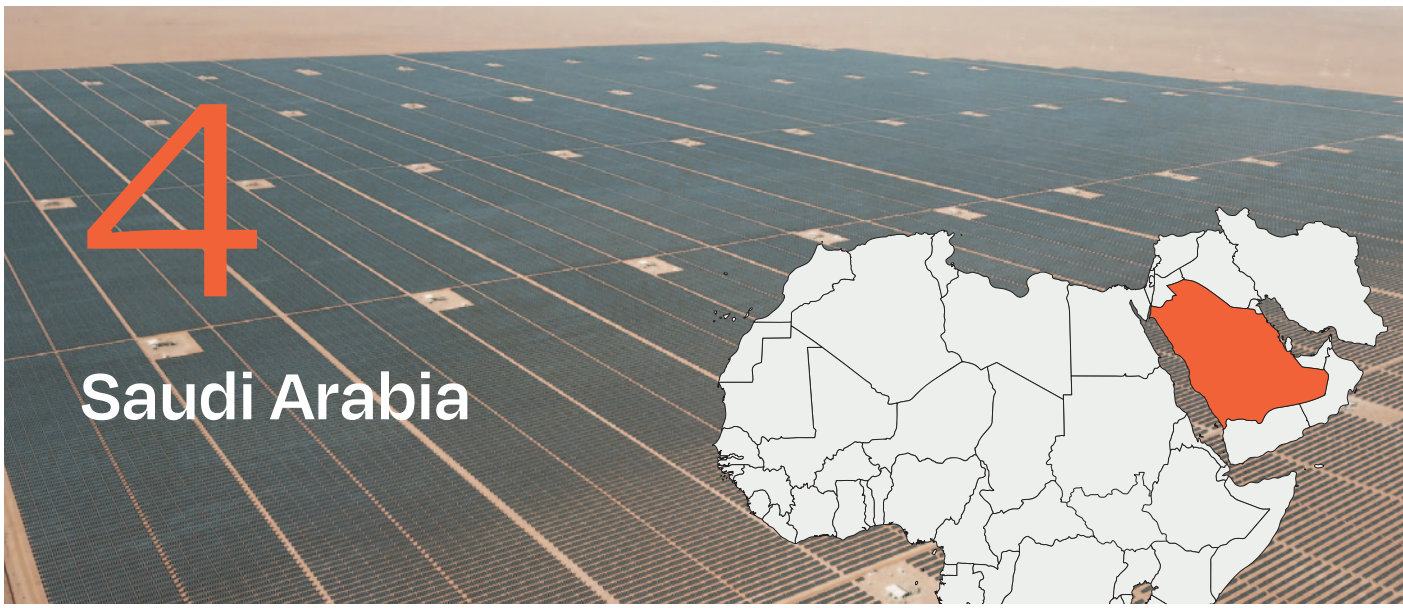


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TABLE 1 MACROECONOMIC DATA OF SAUDI ARABIA

Language	Arabic (English is widely spoken)
Capital	Riyadh
Currency	Saudi-riyal (SAR)
Surface area (2018)	2,150,000 km^2
Population (2020)	33,699,947
Population density (2020)	16 people/km^2
GDP (2020)	700.12 bn US$
GDP per capita (2020)	20,110 US$
GDP annual growth (2020)	-4.1%
MENA region GDP annual growth average (2020)	-4.0%
Unemployment rate (2020)	8.2%
Literacy rate (2017)	95.3%
Internet connections (% of the population) (2020)	98%
Mobile phone subscriptions per 100 people (2020)	124

SOURCE: World Bank Group, 2017, 2018, 2019, 2020.

4.1. Economic, social and political context

4.1.1. Macroeconomic context

The Saudi Arabian economy is highly dependent on petroleum sector; roughly 87% of Saudi budget revenues, 90% of export earnings and 42% of GDP comes from the petroleum sector.

Starting in 2016 a series of reforms aimed at economic diversification were implemented to increase the labour-force participation of women in the economy, mobilise non-oil revenue and grow services. Since 2016, real growth in non-oil GDP has been significantly stronger than oil GDP. This trend is set to continue with non-oil GDP growth of 4.3% expected in 2021, whilst oil GDP will shrink 0.4% in the sale period (IMF, 2021).

As in many countries, COVID 19 had a significant, negative impact on the economy. For Saudi Arabia, this is compounded by lower global oil prices, which created large shortfalls in fiscal and external positions. This is reflected in the 2020 data.

The 2021 forecast is for a significant improvement based on increasing global oil prices caused by

increasing demand and constrained supply by OPEC+ members and the Public Investment Fund (PIF) taking a larger role in developing the domestic economy.

4.1.2. Business environment

Saudi Arabia is the largest consumer market in the GCC countries. Despite the fall in oil prices, the market in Saudi Arabia has continued to enjoy robust growth, due to a solid base of domestic consumers and growing youth population with high disposable incomes, the rising level of disposable income (higher than the global average), and high consumer confidence index.

Saudi Arabia ranks 62 out of 190 countries in the World Bank's 2020 Doing Business report (World Bank Group, 2020). Across many of the measures that are assessed, the ranking is much higher over important measures for potential investment in PV plants in the country, such as starting a business (38th), dealing with construction permits (28th), registering property (19th) and protecting minority interests (3rd) Saudi Arabia performs relatively well and above its overall ranking. Where the country ranks relatively poorly are in getting credit (80th), trading across borders (86th) and resolving insolvency (168th).

Importantly, investment in or ownership of a business in Saudi Arabia does not require citizenship or a partner or sponsor who is a Saudi citizen.

A resident company is taxed on income arising in Saudi Arabia at a rate of 20% + 2.5% Zakat. A VAT on goods and services was introduced in 2018 and has a current effective rate of 15%. Specific targeted taxes are also levied on fuels and certain consumer goods such as soft drinks and tobacco products. Disposal of shares in a resident company by a non-resident shareholder is subject to a capital gains tax of 20%. Capital gains (or losses) on depreciable assets are not subject to capital gains tax.

There are three main commercially active regions in the Kingdom: the Western Region, with the city of Jeddah as the main commercial centre; the Central Region, including the capital Riyadh; and the Eastern Province, where the oil and gas industry is concentrated.

4.1.3. Political and social context

From a political dimension, Saudi Arabia has been an absolute monarchy since 1932 under the rule of the Al Saud family. The government and ministers are appointed directly by the monarch and the country has been ruled by King Salman bin Abdulaziz since 2015, whilst Crown Prince Mohamed bin Salman has had an increasingly important role since 2016. The extended royal family are active across government agencies and the business community.

A consultative assembly, Majlis al-Shura, is comprised of 150 members all of whom are appointed by the King. At the municipal level, there is a mixed model of some appointed members and some elected. However, the municipal councils are controlled by 13 regional governors appointed by the royal family.

Saudi Arabia has an extensive social welfare system for its citizens. Many public services are provided for free or are greatly discounted, water and electricity prices are heavily subsidised for lower volume consumers, and public education and health services are free.

In recent years there has been social progress for example in areas of women's rights, where women now have the right to drive and hold driving licenses, receive job training from government approved centres and institutes and gain access to employment. The participation rate of women in the labour market has increased to about 18%. Since 2015, women have been allowed to participate in municipal elections.

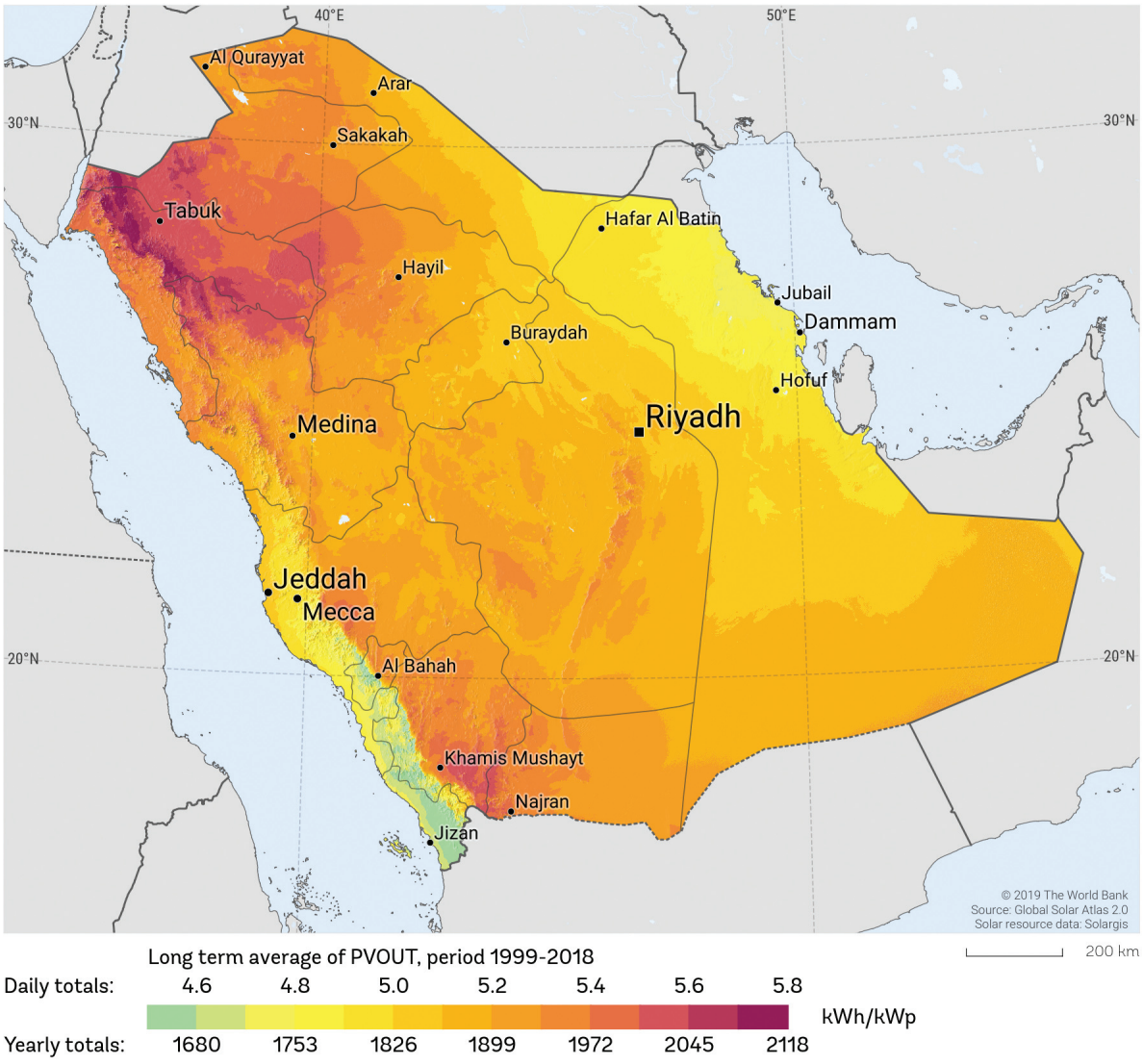
Saudi Arabia has a current literacy rate of around 95% and an objective to raise this to 100% by 2024.

4.2. Energy and electricity

4.2.1. Energy sector situation

Saudi Arabia's energy mix is dominated by fossil fuels. Saudi Arabia had a total primary energy supply of 214,58 ktoe in 2019 (IEA, 2019). The fuel mix comprises (all figures in ktoe): Oil 134,509 (63%), Gas 79,108 (37%) and Renewables 21 (0.006%). The predominance of fossil fuels is also reflected in the country's electricity mix, where gas and oil make up over 99% of the electricity generation sources (Ritchie and Roser, 2020).

FIGURE 10 SAUDI ARABIA'S SOLAR PHOTOVOLTAIC POWER POTENTIAL



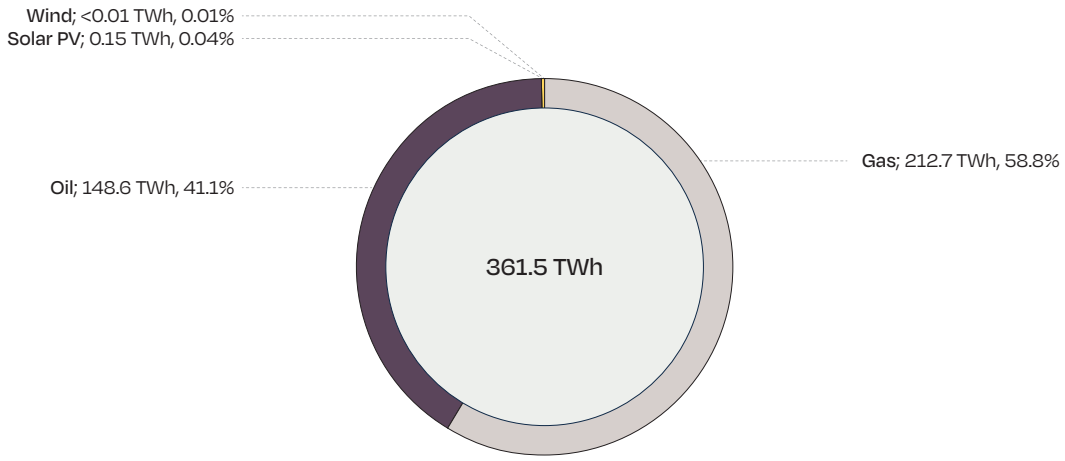
SOURCE: Global Solar Atlas 2.0, Solar resource data: Solargis.

This data is consistent with the overall Middle East region, which has 98% of its primary energy supplied by fossil fuels. Where there is a difference is in the mix between gas and oil. The Middle East energy supply overall comprises natural gas 56% and oil 42%, these figures are 37% and 63% for Saudi Arabia, respectively (IEA, 2018).

There has been relatively little change in the proportionate consumption patterns by sector over the last 15 years. The residential and industrial sectors have both reduced slightly and the governmental and commercial sectors have increased slightly (Saudi Central Bank – SAMA, 2021).

Summarised consumption data from 2009 indicated that HVAC was a significant use within the residential, commercial and governmental sectors, accounting for approximately 70% of consumption overall in those sectors (IRENA, 2012).

FIGURE 11 SAUDI ARABIA'S ELECTRICITY MIX IN 2019



SOURCE: Ritchie and Roser, published on OurWorldInData.org, 2020.

Overall generation in Saudi Arabia was 361.46 TWh in 2019. 148.63 TWh (41%) was generated from oil and 212.67 TWh (59%) from gas. Electricity generation from renewables was 0.16 TWh (0.04%) (Ritchie and Roser, 2020).

A part of Saudi Arabia's Vision 2030 program (Government of Saudi Arabia, 2016) is an initiative which aims to increase the renewable energy production, achieve a balance in the mix of local energy sources, and fulfil the Saudi Arabia's carbon dioxide emissions reduction targets. Through the program, the Ministry of Energy's aim is to increase the share of natural gas and renewable energy sources (in gross ktoe energy terms) to approximately 50% by 2030 (currently 37%) while reducing the use of liquid fuel.

This also presents opportunities private sector investment and public sector partnerships and the creation of a competitive local market for renewable energy, based on the renewable energy resources available to it.

4.2.2. Electricity infrastructure

Saudi Arabia is in the process of reforming its electricity sector away from a vertically integrated utility into a competitive market with the aim of improving efficiency through transparent price discovery and greater participation.

Despite recent efforts to liberalise the generation sector, the state-owned Saudi Elelctric Company (SEC) still comprises 74% of the total energy for sale in the Kingdom (SEC, 2021). However, there has been an increase in the number of IPPs in the country, which now stand at 12 in total. Seven of these are active, three are under construction and a further two are in the procurement stage. The first IPP in the country was the Shuaibah plant. This is a 900 MW steam turbine plant that provides water and electricity to an area that includes the cities of Makkah, Jeddah, Taif and Al-Baha. The plant is operated on a build-own-operate model with a PPA for 20 years. Since it started operation, Shuaibah has undergone two expansions adding more water desalination capacity to respond to increasing demand for water from end users (ACWA Power, 2021).

The Rabigh IPP represents a big milestone for the generation industry in Saudi Arabia as it is the first IPP project to be procured without a sovereign guarantee. The oil-fired power project can produce 1204 MW of power and became operational in 2013. In 2016, ACWA power sought the refinance the existing project debt. The refinancing facilities amounted to the equivalent of 1.82 billion US$ in aggregate, highlighting the strength of the Saudi IPP model in the eyes of banks. The PPA runs for 20 years on a build-own-operate model (ACWA Power, 2021).

Other operating IPPs include a 1,729 MW gas-fired combined-cycle powerplant outside Riaydh (Sojitz Corporation, 2013), a similar 3,927 MW power plant in the country's Eastern Province, and an exclusively gas-fired 2060 MW powerplant in Rabigh (ACWA Power, 2021). The most recent IPP to come online was the Fadhili gas and cogeneration plant with a capacity of 1,507 MW (ENGIE, 2017). The Shuqaiq IPP is part of the second phase of the Shuqaiq complex that produces water and power for the Assir region. The project is an 850 MW steam turbine plant that has been in operation since mid-2011. It has a 20-year PPA under a build-own-operate model (ACWA Power, 2021). The 2,745 MW Jubail steam and gas plant provides water and power to the Eastern Province region of the Saudi Arabia. The PPA has a 20-year span and operates on a build-own-operate basis (Marafiq, 2021). All of these IPPs have a 20-year PPA with SEC and operate on a build-own-operate basis.

More recently, tenders for IPPs in Saudi Arabia have moved away from conventional fuels and towards renewables. The Sakaka 300 MW PV power plant is the first utility scale renewable energy project under the country's National Renewable Energy Program (NREP). The tariff was exceptionally low at 0.023 US$/kWh. This time the PPA is for 25 years under a build-own-operate model (ACWA Power, 2021). Prior to this, the 10 MW Layla solar power plant was connected to the grid, supplying 10% of the power needs of the Al-Aflaj province (Macdermott, 2019). However, this IPP was not under the NREP.

The Saudi Power Procurement Company (SPPC) is the principal buyer in the newly unbundled generation market. Unusually, the Saudi government has given it the license to transition the changes in the sector. This means its responsibilities are somewhat wider than other buyers. The SPPC is responsible for developing international partnerships, establishing renewable energy projects, monitoring fuel efficiency and advising regulators on the development of the energy market. In the energy trading sector, it manages all PPAs, develops year-ahead energy allocation plans and the year-ahead generation plan, sets the price for purchasing and selling electricity, manages the budget for the electrical system and the electric tariff balancing fund, and acts as the counterparty to all PPAs and export and import energy contracts to entities outside Saudi Arabia. SPPC also has a controlling role in the IPP sector where it studies, prepares and plans new IPP projects. It is responsible for the tendering process for conventional and RE projects and monitors the implementation of IPPs and PPAs. Alongside this it aims to create an attractive environment for investment in the energy sector.

Transmission is carried out by the National Grid Company, a wholly owned subsidiary of the SEC. It comprises a network of 84,787 kilometers covering more than 13,000 cities and villages, with 1,124 substations and 3,559 transformers, with a peak load of 62 GW. National Grid is responsible for operating the electrical system and transmitting electrical energy from production sites to consumption centres. It also looks to strengthen the electrical system by studying load forecasts and developing plans to meet increases in demand. The National Grid is also the key interlocuter for IPPs, signing PPAs and representing SEC as a buyer.

Distribution is carried out exclusively by SEC.

4.2.3. Stakeholders, tariffs and regulatory framework

The electricity ecosystem is made up of several important stakeholders:

- Ministry of Energy: The Ministry of Energy is the national body responsible for oversight of the energy ecosystem in Saudi Arabia and determining its strategic direction.
- Renewable Energy Project Development Office (REPDO): REPDO sits within the Saudi Ministry of Energy and is responsible for the coordination of the country's National Renewable Energy Programme (NREP). It develops the tenders for renewable energy projects under the programme and supports all RE related initiatives in the Saudi Arabia. It also has an important oversight function as it regularly reviews legal and regulatory frameworks surrounding renewable energy.
- Water & Electricity Regulatory Authority (WERA): WERA is the regulatory body for the electricity and water desalination sector in Saudi Arabia. It is in charge of issuing licences for generation, transmission, distribution, retailing and trading of electricity and cogeneration services, and desalinated water. It also coordinates the infrastructure of the electricity and water

desalination sector, developing plans for its expansion. It sets the tariffs for the supply of electricity, cogeneration and water desalination services and looks to improve sector performance. WERA is responsible for developing best practices and standards in the electricity and water desalination sector too. Finally, it looks to encourage private sector participation and investments in the sector and its infrastructure.

- Saudi Energy Efficiency Centre (SEEC): The SEEC is responsible for improving energy efficiency in Saudi Arabia. It develops national energy efficiency programmes and helps identify objectives and policies for energy efficiency. It also develops and issues standards and technical regulations to improve energy efficiency.
- National Energy Services Company (Tarshid): Tarshid was established by the Public Investment Fund (Saudi Arabia's sovereign wealth fund) to improve energy efficiency in Saudi Arabia. It does so by developing, funding, and managing energy efficiency projects in both the public and private sectors that aim to achieve significant energy savings for the country.
- Saudi Electric Company (SEC): The SEC enjoys a monopoly over the transmission and distribution of electricity in the Kingdom and owns and operates the majority of the generation capacity. The Saudi government directly owns 74.3% of SEC and has indirect control over a further 6.9% which is owned by Saudi Aramco. The remaining 18.8% is owned by institutions and retail investors within the Kingdom. The company's principal activity is in power generation, where its mission is to energise the entire network and respond to growing demand whilst optimising resources to reduce the cost of electrical energy production. The distribution arm of SEC is responsible for the medium and low voltage power lines that connect high voltage transmission substations to local substations and end users. It also handles metering, billing, collection of payments and electrical service connections for end users.
- National Grid Company: Transmission is carried out via the National Grid Company, which is wholly owned by SEC.
- Saudi Power Procurement Company (SPPC): The SPPC is the principal buyer in the newly unbundled generation market.
- Local Content & Government Procurement Authority (LCGPA): The LCGPA was established in December 2018 and is responsible for developing all aspects of local content requirements ad policy for the Saudi economy. It formulates policies and regulations, identifies key targets, measures and reports on the impact of local content, and refines government procurement procedures.

The electricity price is low and varies by customer type and ranges from 18 Halalah/kWh (0.049 US$/kWh) for residential consumers under 6,000 kWh and industrial consumers, to 30 Halalah/kWh (0.081 US$/kWh) for commercial and residential consumers consuming greater than 6,000 kWh (SEC, 2018). For comparison, the contracted price from the 1.5 GW Sundair Solar PV plant which recently achieved financial close, is 0.01239 US$/kWh (Bellini, 2021) and a 300 MW plant south-east of Jeddah has a contract price of 0.0162 US$/kWh (Scully, 2021).

Currently, there is no specific regulatory framework for renewable energy generation, transmission and distribution. Regulation is governed by the Electricity Law and its Implementing Regulations and regulated by WERA. Any entity wishing to undertake an Electricity Activity is required to obtain and maintain a valid licence from WERA. A number of additional approvals such as: environmental and social impact assessment and building or construction permits (depending on the location). Approvals or no-objection certificates are also required for example from Civil Defence and Saudi Telecoms.

Connection to the transmission grid requires an interconnect application with the National Grid Company, leading to a connection agreement. Any grid upgrades required as a result of connection as paid for by the National grid Company. The developer is responsible for costs of grid connection. The Saudi Arabia Grid Code includes requirements for voltage, frequency and modulation of generation from renewables. There are similar standards within the Distribution Code where connection is to a distribution network. There is currently no legal or regulatory framework for storage.

4.2.4. Update on solar market demand

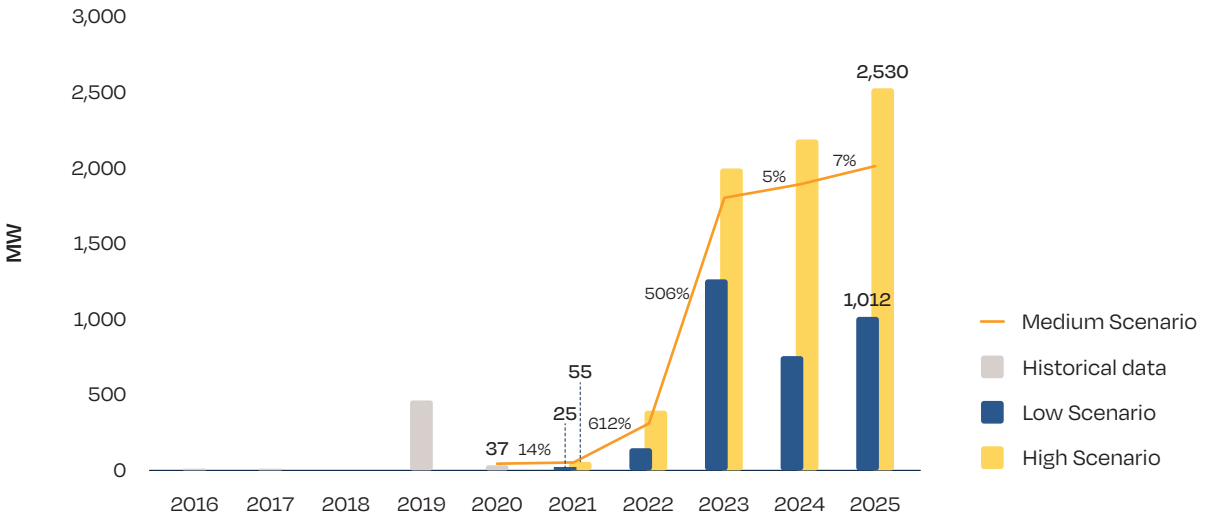
In 2020 Saudi Arabia had a cumulative installed solar capacity of 515 MW. The country's annual market is yet to find a sustained rhythm of growth. In 2019, it installed 459 MW which was far more than the combined installations of 2016, 2017, 2018, and 2020 (56MW). However, despite this slow start, the future of solar PV in Saudi Arabia is bright. According to all SolarPower Europe's scenarios, the market should hit GW-scale in 2023 as efforts increase to fulfil the renewable energy targets in Vision 2030. This rise in annual installations represents a meteoric three figure growth rate between 2021-2023 (SolarPower Europe, 2021).

In its Vision 2030 document, Saudi Arabia forecasts that energy consumption would increase threefold between 2016 and 2030. In response to this increased demand, the country plans to develop its own renewable energy market with a target of 9.5 GW by 2030. As part of the market's development Saudi Arabia will seek to localise a significant proportion of the value chain, including R&D and manufacturing. From these ambitions grew the National Renewable Energy Programme (NREP) which is responsible for carrying out the vision of a national renewable energy industry (Government of Saudi Arabia, 2021).

The NREP's first tender was launched in 2017 and included one 300 MW solar PV project. In 2019 six solar PV projects were tendered, ranging from 20 MW up to the 600 MW Al-Faisliyah solar PV plant. The latest round of tenders included four solar PV projects ranging in size from 80 MW to 700 MW. The projects from rounds two and three of the NREP amount to 2,670 MW of installed solar capacity in the country (REPDO, 2020).

As part of localising the R&D and manufacturing parts of the solar PV value chain, REPDO has, along with the LCGPA, established a timeline for the introduction of local content requirements in its tenders. To spur supply chain development in the short term, tenders will start to contain a 17-19% local content requirement. By 2024-2025 Saudi Arabia hopes to have established solar and wind clusters in the country and plans to introduce a 33-35% local content requirement in its tenders. In the long term (2028 onwards), the attention will turn from internal market development and become more export oriented, including a 40-45% local content requirement in tenders (REPDO, 2020).

FIGURE 12 SAUDI ARABIA'S ANNUAL SOLAR PV MARKET - HISTORICAL DATA AND FORECAST FOR THE UPCOMING 5 YEARS



SOURCE: SolarPower Europe, 2021.

4.3. Recommendations

Make the PV development strategy and implementation plan transparent. Saudi Arabia has ambitious plans to significantly increase the amount of electricity generated from PV. Making these plans available and establishing a process to enable international partners to become involved early in the planning process could benefit Saudi Arabia by increasing the competition for development, financing, design and engineering of PV plants. This will ensure the best partners are attracted to the market and assist in ensuring competitive prices.

Ensure counterparty security is robust. International partners need to ensure that the project's revenue streams are secure and that they can repatriate (or reinvest) capital. The continuation of the current mechanism of contracting long-term PPA centrally through SPPC is encouraged. As the reforms towards a market model evolve in Saudi Arabia, this process can be reviewed, but in the period when the utility scale PV market is being established, the system should be retained.

Focus on quality as well as price. It is particularly important in emerging markets to ensure that robust quality mechanisms are in place to ensure best life-time value, not cheapest initial cost. This aims to optimise the economic return over the life of the plant. International standards and conformity assessment systems such as IEC and IECRE can be used as a mechanism to ensure the quality of components, EPC and O&M for PV plants.

Continue to enable distributed solar PV. As well as focussing on the development of utility scale PV plants, policies to further encourage distributed generation should be developed for the commercial and industrial and residential markets. As a significant proportion of electricity consumption is HVAC, distributed generation of solar could significantly reduce daytime demand peaks.

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